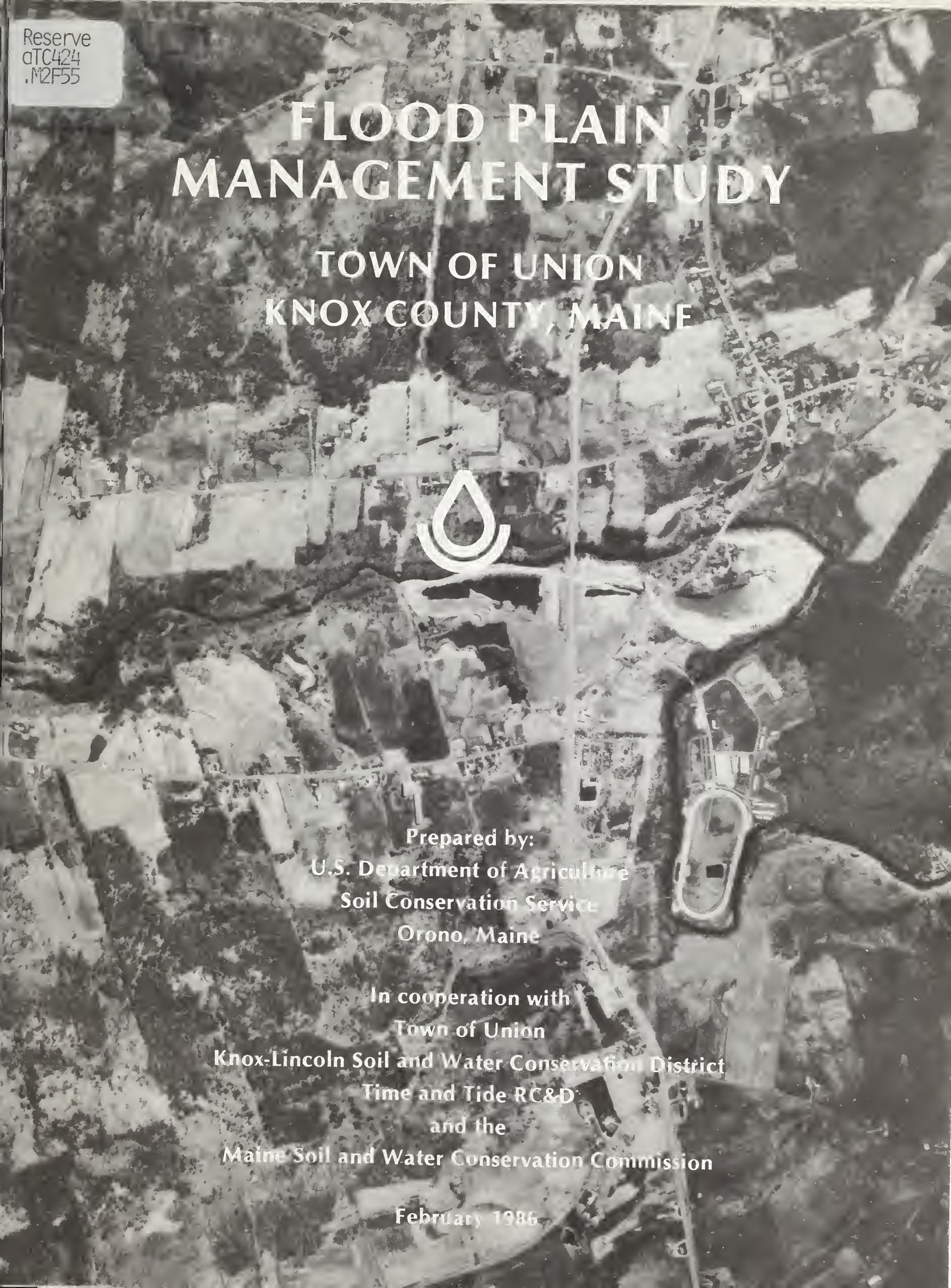

FLOOD PLAIN MANAGEMENT STUDY

TOWN OF UNION
KNOX COUNTY, MAINE

Prepared by:
U.S. Department of Agriculture
Soil Conservation Service
Orono, Maine

In cooperation with
Town of Union
Knox-Lincoln Soil and Water Conservation District
Time and Tide RC&D
and the
Maine Soil and Water Conservation Commission

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FLOOD PLAIN MANAGEMENT STUDY

UNION, MAINE

Introduction

This report presents flood plain information along the Crawford, Medomak and St. George Rivers, Mill Stream, and Crawford, Lermond, Round, Sennebec, and Seven Tree Ponds within the town of Union. Data generated as a result of this study consists of a flood hazard evaluation, including flood plain maps and profiles, recommendations for flood protection, and an inventory of natural resource values served by the flood plains.

The town of Union will use the technical information provided in this study to identify flood plain areas, and as a guide for developing a flood plain management program for the areas studied. This report will provide the town with information needed to comply with Maine's "Mandatory Zoning and Subdivision Control Law", which applies to shoreland areas. Such regulations are needed to minimize loss of life and property damage from future floods, prevent environmental degradation of the area's resources and ensure orderly community growth. The data generated from this study can also be used for developing conservation plans, the design of hydraulic structures, roads, bridges, and other types of community planning by federal, state, and local agencies, planning groups, engineers, and conservation district cooperators.

This study was performed in response to a request by the town of Union to the Maine Soil and Water Conservation Commission (MSWCC). A cooperative

Plan of Work was approved by the town and the MSWCC in December 1981, and authorized by the Soil Conservation Service (SCS) in January 1982. That plan provides the basis for funding and also outlines the areas to be included and scope of the study.

The SCS, United States Department of Agriculture, carries out Flood Plain Management Studies under the provisions of Federal Level Recommendation (3) of A Unified National Program for Flood Plain Management, Water Resources Council, September 1979, in accordance with Section 6 of Public Law 83-566, the Watershed Protection and Flood Prevention Act (1954). Priorities of studies in Maine are established by the MSWCC through a Joint Coordination Agreement between the Commission and SCS to carry out these studies.

The Watershed

The areas studied in this report are completely contained within the St. George River and the Medomak River watersheds. These watersheds in turn are members of a group of rivers known collectively as the Central Coastal Basin. Located in mid-coastal Maine the Central Coastal Basin is bounded by the Penobscot River Basin to the north and east and the Kennebec River Basin to the northwest (see Watershed Location Map). The Central Coastal Basin has a combined drainage area of 1,473 square miles. The largest watershed in the basin is the St. George River with 258 square miles. The Medomak River, having a drainage area of 109 square miles, is the fourth largest watershed in the Basin.

The bedrock of the Central Coastal area is almost entirely schist and gneiss. A small mass of granite occurs about midway between Penobscot Bay

and the mouth of the Kennebec River, along both sides of Muscongus Bay. On the west shore of Penobscot Bay, around Belfast and in the Thomaston-Rockland vicinity, there are long, narrow, northeast-southwest trending zones of metamorphosed Ordovician sediments. These rocks include the limestone beds which are worked at Thomaston to produce portland cement and which once supplied the kilns of Thomaston, Rockland, Rockport, and Camden. Active quarries, primarily for agricultural lime, are located in Union and Warren.

The uplands throughout the Central Coastal area are blanketed by a thin veneer of glacial till consisting of bouldery, silty, gravelly sand through which the bedrock projects in bold ridges. Glacial sand and gravel, outwashed from the glacier, form eskers, terraces and kames that overlie the till in the valleys. The sand and gravel in the lowlands is generally buried under marine clay and in many sections only the highest parts of the esker ridges project through the clay. Deltas are found in places where the glacial meltwater streams, carrying sand and gravel, debouched through low saddles in the bedrock ridges. These ridges acted as successive barriers between the ice sheet and the sea as the glacier receded and the sea encroached on the depressed land. Limited beach deposits, derived from the reworking of the thin till, locally mark the former locations of sea level on the upper slopes.

SOIL CONSERVATION SERVICE
U.S. DEPARTMENT OF AGRICULTURE

WATERSHED LOCATION MAP
CENTRAL COASTAL BASIN

- AREA . . . . 1473 sq. miles
- POPULATION 99,000
- MAJOR TOWNS. . . . Bath, Topsham Rockland, Camden, Belfast
- PRINCIPAL STREAMS

1 Coastal drainages	610	sq. mi.
2 St. George	258	sq. mi.
3 Sheepscot	252	sq. mi.
4 Medomak	109	sq. mi.
5 Damariscotta	103	sq. mi.
6 Passagassawakeag	91	sq. mi.
7 Eastern	50	sq. mi.

Glaciation and marine invasion considerably modified the topography of the Central Coastal area by filling the valleys, building large deltas and terraces against the flanks of the bedrock ridges, and to a considerable extent, deranging the old drainage system. Although uplift of the land forced the sea to retreat to the present coastline, the lower parts of the old river valleys are still submerged beneath the marine waters. For this reason, the Maine coast particularly in this area, is classified as a ria or drowned-river-valley coast. Differential erosion of alternating weak and resistant strata resulted in ridges and valleys which are greatly elongated toward the northeast-southwest in accordance with the trend of the rock structure.

The relief of the Central Coastal area is generally moderate with hills and ridges rising 200 to 800 feet above the flat valley floors. Scattered monadnocks rise to elevations of 1,000 feet or more above sea level. Mt. Megunticook, the highest point in this basin area, rises directly from the sea near Camden to an elevation of 1,380 feet, N.G.V.D. Lakes and ponds are numerous and are scattered throughout the region. (1)

The Central Coastal Basin is located in the Coastal Climatic Zone and has average daily temperatures that range from 23° F in January to 66° F in July. The average annual precipitation is approximately 44 inches which include the water equivalent of some 70 inches of snow. (2) Although average precipitation is rather evenly distributed throughout the year, monthly totals are about four inches during the winter as compared to three inches during the summer in the Coastal Zone. Thunderstorm activity is

somewhat suppressed by the effects of the cool ocean while winter precipitation is increased by coastal storms or "northeasters".

Within the southwest portion of the Coastal Area, runoff in the watersheds can amount to nearly 50 percent of the annual precipitation. Historically, man's major impact on the basins' hydrology has been damming the rivers. These basins represent perhaps the most densely dammed area in the state. All but the smallest rivers have been dammed for power and other purposes although only a few are presently used to generate power.

There are numerous lakes and ponds scattered throughout the St. George and Medomak River watersheds, providing substantial storage for flood water, the following table displays the larger lakes and ponds in the watersheds by surface and drainage area.

Name	Surface Area (3) (Acres)	Drainage Area (Square Miles)
St. George River Watershed		
St. George Lake	1,095	6.62
Quantabacook Lake	693	14.89
Crawford Pond	591	30.13
Alford Pond	577	7.26
South Pond	548	9.59
Sennebec Pond	532	112.20
Seven Tree Pond	523	158.46
North Pond	338	17.59
Stevens Pond	336	11.39
Medomak River Watershed		
Washington Pond	551	4.30

Land use in the St. George and Medomak watersheds is broken down as follows:

	St. George River Watershed	Medomak River Wateshed
Forest Land	69%	75%
Open Land	25%	21%
Water Areas	5%	3%
Urban	1%	1%

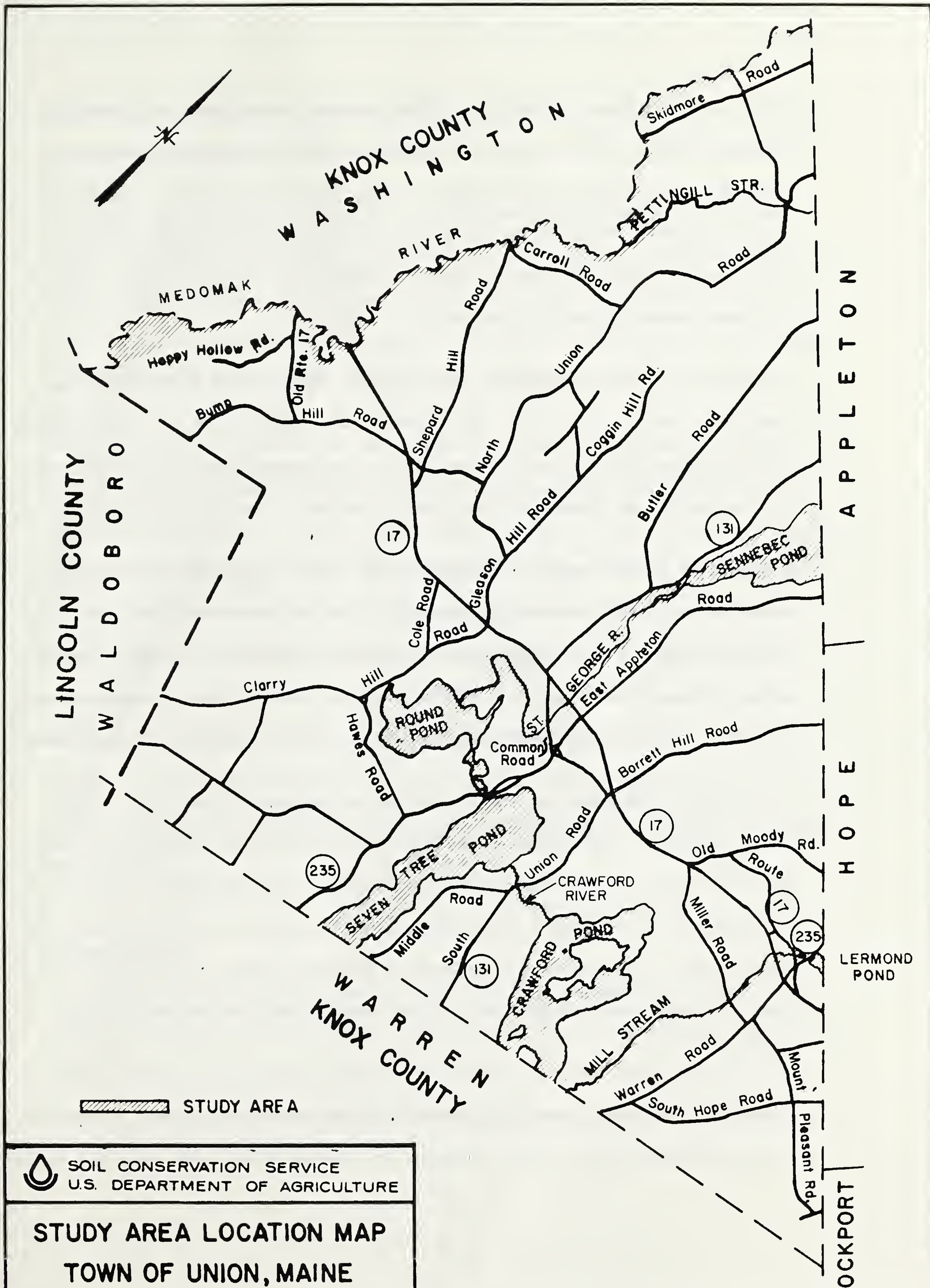
Ground Water in the basins is derived from both bedrock and till. Bedrock wells 100 to 200 feet deep can yield five to 12 gallons per minute while those 600 feet deep can yield up to 80 gpm. Wells in till on the other hand, generally supply only enough for rural homes and farms and may go dry in prolonged drought. Ground water quality is generally satisfactory, but is somewhat harder and contains higher concentrations of minerals and suspended materials than the surface waters. (1)

The hydrologic unit code for the basin is 01050003000. The study area is located in sub basins 01050003010, 01050003020, and 01050003040. (4)

The Study Area

The town of Union, in which the study area is located, is situated in Knox County approximately 60 miles northeast of Portland (Maine's largest city), 25 miles southeast of Augusta (the capitol), 45 miles southwest of Bangor (3rd largest city in Maine), and 14 miles from the seacoast and the city of Rockland. The study area (see Study Area Location Map) includes the Crawford, Medomak, and St. George Rivers, Mill Stream, and Crawford, Lermond, Round, Sennebec, and Seven Tree Ponds within the town of Union.

The Medomak River flows southwesterly forming Union's western boundary with the town of Washington. It passes through 12.3 miles of relatively under-developed land (predominately woodland and wetland) as it meanders from the Appleton-Union town line, where its drainage area is 16.5 square miles, to the Union-Waldoboro town line where the drainage area has increased to 46.1 square miles.



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U.S. DEPARTMENT OF AGRICULTURE

STUDY AREA LOCATION MAP
TOWN OF UNION, MAINE

The St. George River enters Union from Appleton while passing through Sennebec Pond. At the outlet of Sennebec Pond the St. George has a drainage area of 112.2 square miles. The river then flows southerly for 3.1 miles past lime quarries, a small urbanized area, and the Union Fairgrounds. The river then passes through Round and Seven Tree Ponds as it flows toward Warren to the south.

The Crawford River originates at the outlet of Crawford Pond, where its drainage area is 30.1 square miles and flows easterly for 0.7 mile through the urbanized area of South Union to its confluence with Seven Tree Pond. At this point the Crawford River has a drainage area of 30.3 square miles.

Originating at the outlet of Lermond Pond, with a drainage area of 8.5 square miles, Mill Stream flows for 3.4 miles in a southerly direction to Crawford Pond where its drainage area is 10.4 square miles. Mill Stream passes through the urban area of East Union, a fairly steep, wooded stretch, and then through broad, flat wetlands as it travels between the two ponds.

Ponds studied include the Union portions of Sennebec Pond (232 acres), Seven Tree Pond (453 acres), Crawford Pond (491 acres), and Lermond Pond (20 acres), and all of Round Pond (250 acres). All of these ponds have been moderately developed for recreational use such as seasonal homes and campgrounds. Land not yet developed is primarily farm or woodland. Scattered year-round homes can also be found along the shores of these ponds.

There are 16 bridges spanning streams studied in Union. These include four over the Medomak River, four over the St. George River, one over the outlet

of Round Pond, one over the Crawford River, and six over Mill Stream (see Bridge Data-Appendix).

Five dams are currently located on the streams studied in Union. This number includes one on the St. George River, one on the Crawford River, and three on Mill Stream. The locations of these dams are shown on the Flood Plain Maps and on the Flood Profiles. Additional information on these dams may be found in the Dam Data Table in the Appendix.

The soils in the flood plains and terraces of the study area are predominately Boothbay and Swanville soils with a few scattered bottom lands containing Charles soils. A few high stream terraces are gravelly and contain Masardis soils. The soils on the uplands are formed mainly in glacial till and are dominately Marlow, Peru, Tunbridge and Lyman soils. Knox and Lincoln Counties have been completely soil mapped and the soil survey is scheduled for publication in October 1986. In the interim, soils information may be obtained from the SCS Field Office in Waldoboro. Based on the soil survey information much of the land in and adjacent to the flood plains studied is considered to be prime farmland or farmland of statewide importance.

Natural Values

The town of Union was first settled in 1772 by a group of young men called the Anderson Party. In 1774 Dr. Taylor bought the whole township of 34,560 acres and the town became known as Taylortown. Later the town was organized as a plantation containing 70 people and was called Sterlingtown. In

1786 it was incorporated and because of the uncommon harmony of the people, was named Union. (5)

The St. George River valley area is rich in historical significance. The River was once known by the Indian names Segoerquet, and Georgekee, whence was probably derived its present name of George's.

The river system was very important to the early settlers providing for transportation, a source of food, and power.

The year 1794 witnessed the beginnings of a canal that was to bypass several stretches of the St. George River which were difficult to navigate. After the efforts of many people, including General Henry Knox, the waterway was used intermittently. The planners had intended to make a usable waterway from tidewater in Warren to places as far north as Searsmont and Liberty. The width of the structure indicates that the boats were small and the lack of a complete tow path suggests that the boats were poled through the canal. Rock structures within the canal tell of the location of locks which were necessary to provide different water levels in the canal. In 1850 the last boat went down the canal. After well over one hundred years of neglect, the George's River was recognized as a National Register Historic Site in 1970. Remnants of the canal can still be seen in Union.

Other places of historic significance in Union are the Ebenezer Alden House, and the Lermond Mill which are on the National Register of Historic Sites, and the Matthews Museum of Maine Heritage.

Agriculture and forestry play a major role in the economy of Union. Much of the land along the St. George River, being very fertile and adapted to the growing of most crops, was once in farms with a large portion of the land cleared. Grist mills ground local grain, bricks were baked, and a tannery was operated along the river. The Farmer's Woolen Mill was also located on the river and processed wool from area farmers. In the early part of this century Union was famous for its many apple orchards. However, the frigid winter in 1934 killed most of the trees.

Presently there are eight large dairy farms, several apple orchards, a number of small family farms, and several truck farms located in Union. Major crops grown in Union include blueberries, corn, apples, squash, and hay. Approximately 20 percent of the land in the 100-year flood plain of Union is classified as being prime farmland. Slightly over 10 percent of this land is currently being utilized for farming with the remainder being predominately woodland.

The portions of Union that are forested are made up primarily of red oak, red maple, poplar, white pine, and balsam fir stands. Forest land accounts for approximately one-fourth of the land area of Union. From this land are harvested products such as pulpwood, lumber, firewood, and Christmas trees.

Wetland areas found in Union are primarily the wooded or shrub type with some areas having emergent type vegetation. The largest wetlands in the study area are found along the Medomak River and around Round Pond. A thin band of wooded and shrub swamps are generally found around the lake and pond areas.

Typical wildlife species found in these wetland areas would include the black duck, hooded merganser, Canada goose, wood duck, bald eagle, osprey, hawks, beaver, otter and muskrat. Upland game species such as the white-tailed deer, raccoon, song birds and an occasional moose utilize not only the wetland areas but also higher, drier agricultural and wooded land.

Protecting flood plains from development and maintaining natural vegetation along the shores will help protect the wildlife, economic, and recreation values of the area.

The St. George is a coastal river of high commercial significance due to the presence of alewife, an anadromous fish. The river also provides high quality habitat for other anadromous fish such as sea run brown trout, rainbow smelt, American shad, American eel, blue-backed herring, and striped bass. The low acidity water, due to the presence of significant amounts of limestone, is unique among Maine rivers. Due to its commercial importance, the St. George should be recognized as one of the state's most significant anadromous fish resources. (6)

Inland fish found in the lakes and rivers of Union are primarily warm water species such as black bass, white perch, and pickerel although brook trout and brown trout are taken from small, cooler tributaries. Local use of fisheries is high.

Recreation on the St. George River has some good potential. Currently there is no large scale commercial recreational enterprise on the river. There are small campgrounds located on Crawford, and Sennebec Pond, and a

town run park (Ayer Park) on Seven Tree Pond. There are many privately owned camps along much of Seven Tree Pond, Sennebec Pond, and Crawford Pond. The scenic St. George River offers canoeists of all proficiencies an opportunity to enjoy wildlife and beautiful scenery. Rising in Lake St. George the river offers mixed flat and rapid waters winding through pleasant, open countryside for 34 miles to the sea. There are several inoperable dams and sharp drops, especially below Sennebec Pond. In the spring there are plenty of chances to white water canoe while later in the season flat water offers families a nice day trip. At this time there is only limited public access to the St. George River in Union thus limiting public use of the river and ponds in this area. The Time and Tide RC&D, St. George River Study Committee has recently completed an overview and recommendations for public access to the St. George River. They have located 16 possible access sites between the towns of Thomaston and Montville, two of these sites are in Union and are indicated on the Flood Plain Maps. The Study Committee suggests that only parking and boat launching areas be developed at these sites, along with easements to portage at certain areas of the river.

Both the St. George and Medomak Rivers have been listed in the Maine Rivers Study (6) as having resource values of statewide and/or regional significance. The St. George River appears on the study's final list of "B" rivers (rivers that possess a composite natural and recreational resource value with outstanding statewide significance). The St. George was identified as having unique/significant river resource values in the following areas: critical/ecologic, anadromous fishery (among the state's most

significant), inland fishery, canoe touring, and historic. The Medomak is on the study's final list of "D" rivers (those rivers that possess natural and recreational values with regional significance) and is identified as having unique/significant resource values in the areas of: critical/ecologic, and anadromous fishery.

The use of the rivers in Union for water power has historically been high. There are currently five dams located on the rivers studied in Union. Two of these are used for power generation, two for recreational water impoundment, and the other is partially breached. The Sennebec Pond dam is currently being renovated for proposed power generation. As a part of this project, a fish ladder is to be constructed at the dam. None of the other dams in Union presently have fishways. Further information on these dams can be found in the Dam Data Table in the Appendix.

The geology of the area is quite interesting and has had and will probably continue to have significant impact on the economy of Union. A considerable quantity of limestone is found just west of the St. George River and in small, old quarries from Crawford Pond to Alford Lake in Hope. Nickel, copper, iron and zinc deposits have been found throughout Union in small quantities but with little economic prospects at this time. Of economic significance are the several gravel deposits along the Medomak river in the Happy Hollow area. Dragon Products Company provides high grade agricultural limestone from its quarries as well as "paper rock" used by Maine paper companies. Of possible future significance is perhaps two million tons of low grade iron, nickel and copper sulfides under and northeast of

Crawford Pond. Consideration has been given in the past to mining of andalusite to be crushed and used in sandpaper.

The most recent classification of the St. George River according to Maine Department of Environmental Protection (ME DEP) standards is Class C, i.e., waters of this classification shall be of such quality as to be satisfactory for recreational boating and fishing, for fish and wildlife habitat and for other uses except potable water supplies and water contact recreation, unless such waters are adequately treated. The Medomak River is classified as being B-2. Waters of this class shall be acceptable for recreational purposes including water contact recreation, for industrial and potable water supplies after adequate treatment and for fish and wildlife habitat. The Crawford River and Mill Stream are classified as being B-1. Waters of this class are considered the higher quality of the Class B group and shall be suitable for all uses described under B-2. Crawford, Lermond, Round, Sennebec, and Seven Tree Ponds are classified GP-A. Water of this class shall be suitable for recreational purposes, including bathing, fish and wildlife habitat and for public water supplies after disinfection. (7)

The St. George River from Union Village to Round Pond has been listed as a medium priority water quality area by ME DEP. Round Pond and Seven Tree Pond are listed as being high priority water quality areas. The ME DEP has assigned trophic state index (TSI) numbers to two of the ponds in Union as follows: Crawford Pond 44, and Seven Tree Pond 60. The following table shows the relationship of the TSI number to the water quality of the pond. (8)

Status of Pond	TSI Range
Oligotrophic	0 - 30
Mesotrophic	31 - 60
Eutrophic	61+

Factors contributing to water quality problems in Union are sewage seepage, due to a low absorption rate of the soil in and around Union Village, and non-point sources such as agricultural, forestry, and construction activities throughout the watershed.

Major items that should be considered to enhance the natural and recreational values of the rivers and ponds in Union include the adoption of measures that would regulate development within the 100-year flood plain as well as the preparation of an overall use plan for the river that would set integrated management objectives for such items as public access, historic sites, recreational facilities and the preservation of significant wildlife habitat areas. Other general recommendations include:

1. Maintain wetland and flood plain vegetation buffers to reduce sedimentation and delivery of chemical pollutants to the water body.

2. Support agricultural practices that minimize nutrient flows into water bodies.

3. Support proper use of pesticides and fertilizer.

4. Minimize soil erosion on land within, or adjacent to, flood plains and on forest road systems and timber harvesting operations.

5. Dispose of spoils and waste materials so as not to contaminate ground and surface water or significantly change land contours.

Additional technical information on the above items may be obtained from the SCS field office in Waldoboro.

Flood Problems

Flooding occurs most frequently in early spring when heavy rains on snow-covered or frozen ground produce greater than normal runoff. It is at this time of year that ice breaks loose from streambanks resulting in potential obstructions at bridge openings and other channel constrictions which can artificially raise flood levels. Flash floods occur on occasion from thunderstorms, but these events generally produce less runoff than that associated with spring flooding. Due to the vast amount of storage available in the St. George watershed, flooding along the lakes and ponds is generally caused by prolonged periods of rain rather than a single storm event.

Several dams in the St. George River watershed have been identified by state and local officials as having structural deficiencies. At present they pose a probably but unknown risk to the safety of downstream areas.

The most recent flood in Union occurred in the spring of 1984. A period of rain, which extended from the last week of March through the first week of April, produced high water levels throughout the Medomak and St. George watersheds. Damages along the Medomak River, in Union, were primarily to roads, bridges, and agricultural land. In the St. George watershed pond levels rose dramatically (over 8 feet above normal on Seven Tree and Round Ponds) causing damage to a number of homes, seasonal dwellings, several

commercial properties, the race track and several buildings at the Union Fairgrounds, agricultural land, and septic systems adjacent the ponds. This flood is estimated to have a frequency of 5 years on the Medomak and slightly less than 20 years on the St. George.

A flood very similar to that of 1984 occurred in March 1977. This flood has an estimated frequency of 5 years on the Medomak and 25 years on the St. George.

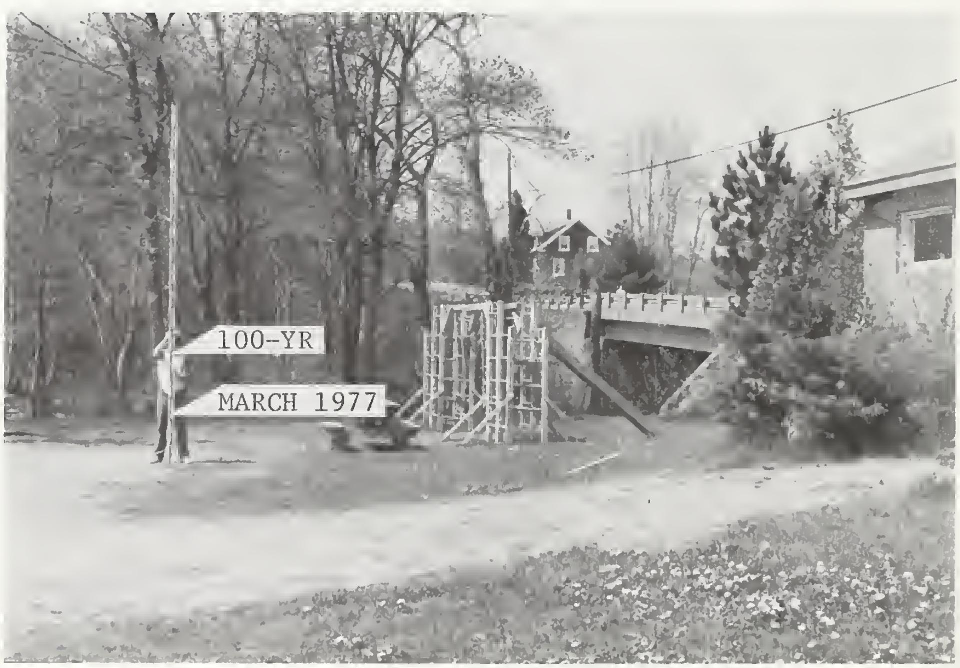
Other floods in the area occurred in 1936, 1940, 1954, and 1973.

Photographs on pages 21 thru 24 show several historic floods and estimated flood elevations at several locations in Union.

Medomak River, Shepard Hill Road, cross section M14B - The 100-year flood is estimated to be at elevation 149.4 feet NGVD or 1.3 feet over the road. (SCS photo)

Medomak River, North Union Road, cross section M26C. The 100-year flood is estimated to be at elevation 181.8 feet NGVD or 2.9 feet above the road. This crossing has washed out on several occasions. (SCS photo)

Sennebec Pond Dam, cross section 23D - The estimated level of the 100-year flood above this dam is 91.9 feet NGVD or 2.8 feet above the point where the person holding the board is standing. (SCS photo)



Ayer Park, on Seven Tree Pond - The estimated elevation of the 100-year flood is 45.4 feet NGVD or 4.9 feet above the ground at this point. The March 1977 flood shown has an estimated frequency of 25-years. (SCS photo)

Union Fairgrounds - This area suffers quite frequent flood damage. The top photo, taken in front of the grandstand, shows the estimated elevation of the 100-year flood to be 45.4 feet NGVD or 5.3 feet above the track. The lower photo shows damage to the track caused by the spring 1984 flood, estimated to be approximately a 20-year event. (SCS photos)

The above photos were taken during the flood of March 1977, which is estimated to have a frequency of 25 years. The top photo is at the outlet of Round Pond and the lower is of Seven Tree Pond. (Bill Cross photos)

The following tables summarize the approximate extent of flooding caused by the 10-, 100-, and 500-year events to: flood plains, properties, and important farmlands.

APPROXIMATE FLOOD PLAIN AREAS (ACRES)[1/]

	10-Year	100-Year	500-Year
Medomak River			
Woodland	140	219	240
Agricultural Land	13	14	16
Wetlands[2/]	362	371	371
Urban[3/]	2	3	3
Other	2	2	2
Subtotal	519	609	632
St. George River			
Woodland	48	64	70
Agricultural Land	5	7	8
Wetlands[2/]	12	14	14
Urban[3/]	9	17	19
Other	4	4	4
Subtotal	78	106	115
Crawford River			
Woodland	2	4	5
Urban[3/]	--	1	1
Subtotal	2	5	6
Mill Stream			
Woodland	57	74	76
Wetland[2/]	21	21	21
Urban[3/]	1	1	1
Subtotal	79	96	98
Seven Tree Pond			
Woodland	27	58	66
Agricultural Land	4	6	7
Wetlands[2/]	27	27	27
Urban[3/]	9	18	21
Subtotal	67	109	121
Round Pond			
Woodland	42	59	75
Agricultural Land	1	2	3
Wetlands[2/]	46	47	47
Urban[3/]	1	2	2
Subtotal	90	110	127

Flood Plain Areas (cont.)

	10-Year	100-Year	500-Year
Sennebec Pond			
Woodland	13	20	21
Wetlands[2/]	4	5	5
Urban[3/]	4	5	6
Subtotal	21	30	32
Crawford Pond			
Woodland	8	18	21
Wetlands[2/]	11	11	11
Urban[3/]	5	8	9
Subtotal	24	37	41
Lermond Pond			
Woodland	6	7	7
Wetlands[2/]	9	11	11
Subtotal	15	18	18
GRAND TOTAL	895	1,120	1,190

APPROXIMATE NUMBER OF PROPERTIES IN FLOOD PLAIN

	10-Year	100-Year	500-Year
Medomak River			
Other	2	2	2
Subtotal	2	2	2
St. George River			
Commercial	--	3	3
Houses	--	1	1
Other	--	22	24
Subtotal	0	26	28
Crawford River			
Houses	--	1	1
Subtotal	0	1	1
Mill Stream			
Commercial	1	1	1
Houses	--	4	5
Subtotal	1	5	6
Seven Tree Pond			
Commercial	2	4	5
Municipal	--	1	1
Trailers	1	2	2
Houses[1/]	4	30	37
Subtotal	7	37	45
Round Pond			
Houses[1/]	1	7	9
Other	--	1	1
Subtotal	1	8	10
Sennebec Pond			
Houses[1/]	5	14	15
Subtotal	5	14	15
Crawford Pond			
Houses[1/]	3	6	7
Subtotal	3	6	7
Lermond Pond			
Other	1	1	1
Subtotal	1	1	1
GRAND TOTAL	20	100	115

APPROXIMATE AREAS OF IMPORTANT FARMLANDS 1/

IN THE FLOOD PLAIN (ACRES)

	10-Year	100-Year	500-Year
Medomak River			
Prime Farmland	69	80	83
Farmlands of Statewide Importance	16	20	23
Subtotal	85	100	106
St. George River			
Prime Farmland	1	7	9
Farmland of Statewide Importance	2	6	7
Subtotal	3	13	16
Crawford River			
Prime Farmland	1	2	2
Subtotal	1	2	2
Mill Stream			
Prime Farmland	2	3	3
Farmland of Statewide Importance	2	2	2
Subtotal	4	5	5
Seven Tree Pond			
Prime Farmland	14	26	30
Farmland of Statewide Importance	9	15	17
Subtotal	23	41	47
Round Pond			
Prime Farmland	14	27	32
Farmland of Statewide Importance	1	2	3
Subtotal	15	29	35
Sennebec Pond			
Prime Farmland	4	6	6
Farmland of Statewide Importance	3	4	4
Subtotal	7	10	10
Crawford Pond			
Prime Farmland	2	3	3
Subtotal	2	3	3
Lermond Pond			
Prime Farmland	3	3	3
Subtotal	3	3	3
GRAND TOTAL	143	206	227

Flood Plain Management

This report is intended to provide a technical basis for arriving at solutions to minimize both present and projected flood damages. The management options presented herein are aimed at providing information on various means of flood protection, and/or alleviation of monetary loss caused by flooding. These options fall into two major categories (non-structural and structural) and are briefly described in this section. With further study, the town or individuals may find one, or a combination of several of these alternatives to be a viable means of reducing flood losses in a given area. Considerations in this evaluation include: if the area being studied is in a high or low hazard zone (see glossary for definitions), engineering feasibility, economics, effect on flooding elsewhere, and social acceptability.

Nonstructural Measures

1. Flood Warning

   In some communities flood warning systems are of major importance in the reduction of flood loss. These systems utilize rainfall and/or water level information in upstream areas to predict flood stages downstream. In nearly all the major damage areas of Union flood stages are reached relatively slowly due to the large volumes of storage available in the watersheds. This allows most residents ample time to take necessary precautions. Because of this and the physical scattering of damage areas in Union, it is doubtful that a warning system,

such as that mentioned above, could be justified. Warning systems might feasibly be installed at the outlets of Sennebec and Lermond Ponds. At these locations they could alert local officials to dangerously high water levels above the dams, or of the actual failure of a dam, although a warning system may not provide adequate lead time for evacuation due to the close proximity of the dams to damage areas.

2. Flood Proofing

Flood damages to some buildings and their contents can be minimized by flood proofing. This methods involves sealing the lower portions of a structure to prevent the entry of flood waters. Some means of sealing include waterproof coatings on foundations, permanently closing and sealing lower openings, and water tight closures that can be quickly and easily installed over openings in the event of flooding.

The use of flood proofing is limited to structurally sound buildings, generally constructed of masonry to a height exceeding the highest designated flood stage.

There are several properties in Union, primarily located on the fringe of the 100-year flood plain where depth and velocity of flood waters is not hazardous, that might be economically flood proofed. Any such structure considered for flood proofing would require an independent evaluation and solution.

Further information on flood proofing is contained in SCS Technical Release 57, Flood Proofing available at nominal cost from:

National Technical Information Service
U.S. Department of Commerce
5285 Port Royal Road
Springfield, Virginia 22151

3. Elevation of Structure

In some cases, it is possible to elevate a structurally sound building above flood stage and flood proof the new foundation. In a number of cases in Union, particularly around the ponds, this method could provide adequate protection to both the structure and its occupants.

However, as structural problems are often encountered in elevating a building, it would be necessary to obtain an engineer's evaluation of any structure for which this method is contemplated.

4. Individual Berms and Floodwalls

Often it is possible to prevent flood water from entering a property by surrounding the property with an earthen berm or masonry wall which exceeds the design flood stage.

This method might have limited use in Union where depths of flooding and velocities are not great. Drawbacks of this method are the high cost of a watertight masonry wall and possible ground water seepage which might defeat the measure. It might also be necessary to use a pump in conjunction with the wall or berm. Structures for which this method is contemplated would have to be evaluated on an individual basis.

5. Purchase and Relocation

In areas where the danger of flooding is so great as to render all

other means of flood protection ineffective or impractical, federal/ state funds may be available to purchase properties and relocate buildings and/or their occupants. Once the properties have been evacuated the land may be used for parks or some other purpose not significantly affected by flood waters.

It is not expected that this approach would have much support or practical application in Union.

6. Land Use Regulation and Flood Insurance

Conservation, scenic or flood control restrictions or easements may be acquired for floodway or flood hazard areas where little or no development is desirable. Land use restrictions can be used to prevent deveopment that is incompatible with public objectives, while allowing continued private ownership of the land. Certain future land use rights, such as construction of buildings that are not consistent with good flood plain management, could be purchased from present landowners. Permitted uses could be farming, wildlife, low-intensity recreation and woodland. Land use restrictions may also result in a lowering of the landowner's tax assessment.

In 1971, the state of Maine enacted the "Mandatory Zoning and Subdivision Control Law" (Chapter 424, Sec. 4811 thru 4814 of the Maine Statutes) which requires all municipal units of government to adopt zoning and subdivision control ordinances for shoreland areas. Shoreland areas are defined as land within 250 feet of the normal high water mark of any pond, river, or salt water body and include at

least a major portion of the flood plain. Under Union's present zoning laws, building permits are required for all new construction in areas covered by its shoreland zoning ordinance.

In 1983, Maine enacted the "Maine Rivers Act" (S.P. 598 - L.D. 1721). This law provides a number of Maine rivers with special protection. Among these rivers is the St. George with special land use restrictions covering certain types of stream alteration, and subdivisions.

Since 1975, Union has participated in the "emergency" phase of the National Flood Insurance Program. This permits existing dwellers within the approximate 100-year flood plain to purchase up to $45,000 worth of flood insurance coverage at subsidized rates on their homes and contents ($100,000 for multi-family and small businesses). The community must require building permits for all proposed construction and review the permit to assure that sites are reasonably free from flooding. For the flood prone areas it is also required that structures be properly anchored and that construction materials and methods be used that will minimize flood damage.

Flood plain regulations and flood insurance cannot prevent flood damages, but they can help alleviate future problems and monetary loss. As of November 30, 1984, there were four flood insurance policies, with a total amount of coverage of $68,000.00 in Union.

7. Warning Signs

A method which has been used successfully in some communities to

discourage flood plain development is the erection of flood warning signs in flood prone areas or the prominent posting of previous or predicted high water levels. This could be done in Union at the fairground, Ayer Park, etc. These signs carry no enforcement, but simply serve to inform the public that a flood hazard exists.

8. Emergency Action Plan

In view of the potential safety hazard os several upstream dams an Emergency Action Plan should be developed for the St. George watershed. This plan would identify when dams in the watershed should be monitored for possible failure, when and where evacuation may be necessary, and where evacuees should be sheltered. The plan should also determine where equipment and materials are available for emergency repairs to a structure, or to a damaged area should a dam(s) failure occur. The goal of an Emergency Action Plan is to reduce loss of life and/or economic damage which might result from a dam(s) failure. In order to prepare such a plan it would be necessary to execute breach routings for the dams in the watershed for preparation of innundation maps showing the extent of flooding should a single or multiple dam failure occur. These maps and information would be used by state, county, and local officials in the preparation of the Emergency Action Plan. The SCS can provide technical assistance for such a plan.

Structural Measures

Structural measures include: dams, channel work, removal of channel restrictions, and dikes. The following discussion touches on each of these as they might apply to the town of Union. Any structural measure would require additional in depth engineering, environmental, and economics studies in order to determine its feasibility. Factors to be considered in the selection of any structural measure are upstream and downstream effects, the cost-benefit ratio, and environmental and social impacts.

1. Dams

Nearly all potential, or existing impoundment sites in the St. George watershed are, or at one time have been dammed. None of these sites individually appear to have sufficient storage potential to reduce downstream flooding significantly. A combination of sites could reduce downstream damages but, as a flood control project alone, would not be cost effective. Certain sites in the watershed have the potential for construction or re-development of dams for purposes other than flood control (such as wildlife preserves, recreation, and hydro power). All sites when, and if, looked at for other purposes should be examined for their possible contribution to flood control in the watershed.

In East Union there appears to be an opportunity to reduce flood damage by constructing an emergency spillway at the dam downstream of the Old State Route 17 bridge. Technical assistance for such a project can be requested through either the Time and Tide RC&D or the SCS Field Office, both in Waldoboro.

2. Channel Work

Channel work is generally undertaken to improve the flood carrying capacity of a given stream section and/or to reduce flood damage along the segment. This work can involve widening or deepening portions of the stream, lining the channel, or changing the stream's alignment.

Channel work was explored, for this report, as a possible means of reducing flood damage on Round and Seven Tree Ponds in Union. Flood levels on these ponds, as are those on North, South, White Oak and Seven Tree Ponds in Warren, are controlled by a natural section of the St. George River extending from the outlet of White Oak Pond to a ledge restriction approximately 10,000 feet downstream of the Middle Road bridge in Warren. Utilizing existing survey data and computer models developed for this and for the Warren Flood Plain Management Study [10] two restrictive portions of the river were artifically altered in an attempt to reduce flood stages on the ponds. None of the various trials made involved alteration of the existing channel but rather attempted to lower flood stages by introducing an "emergency spillway" at the ledge restriction and increasing the capacity of the Middle Road bridge. A number of trials were made which involved "emergency spillways" of various widths and/or alterations of the bridge opening. It was found that a spillway at the ledge combined with bridge modifications could possibly reduce flood stages on the ponds by approximately one foot (each change would contribute approximately 50 percent to the decrease). These alterations appear possible from an engineering standpoint however, economic feasibility

is questionable. A more detailed study of other restrictions in the reach could possibly lead to even lower flood stages, thus increasing the chances for economic viability. Such a study would require additional cross sections to be surveyed on the St. George River and more intensive engineering and economic investigations. The SCS has several programs that could provide further technical and financial assistance for flood prevention measures. Information on these can be obtained from the SCS field office or the Time and Tide RC&D office, both in Waldoboro.

3. Removal of Channel Restrictions

The primary channel restrictions on the rivers and streams in Union, that could be practically dealt with, are the bridges and culverts. As replacement or improvement of these occurs, consideration should be given to enlargement of their discharge capacity to minimize head loss through them. An example of this is the former Old State Route 17 bridge over the Medomak River. The flood stages at that location would be lowered approximately one foot due to the removal of the bridge.

4. Dikes

Dikes would have very little practical application in the town of Union. However a dike has been built behind the grandstand at the Union Fairground. While the dike does not prevent backwater flooding from Round Pond, it does reduce damage at the fairground by keeping the flood flows of the St. George River from crossing the grounds.

Thought should be given to raising, and extending the dike further upstream. This would further enhance its effectiveness.

Floodways

Any encroachments in the flood plain which increase the elevation of the land and/or present obstructions to flood flows will reduce the flood carrying capacity, resulting in increased flood heights and flow velocities. Flood hazards, both upstream and downstream of the encroachment itself, will generally be increased in these situations. One aspect of flood plain management involves balancing the economic gain from flood plain development against the resulting increase in flood hazard. Under this concept, the 100-year flood plain is divided into a floodway and a floodway fringe.

The floodway is the main channel or watercourse plus any adjacent flood plain areas that must be kept free of encroachment so that the 100-year flood can be conveyed without substantial increase in flood heights. Minimum standards of the Federal Insurance Administration (FIA) limit such increases in flood heights to 1.0 foot, provided that hazardous velocities do not result.

The floodway fringe includes that portion of the flood plain that can be completely obstructed without increasing the water surface elevation of the 100-year flood by more than 1.0 foot any at point. Theoretical floodways were computed by SCS for the Medomak, St. George and Crawford Rivers, and Mill Stream within Union. They were computed on the basis of equal conveyance reduction from each side of the flood plain.

Floodway data are not included in this report but may be obtained upon request from the U.S. Soil Conservation Service, USDA Office Building, University of Maine, Orono, Maine 04473, telephone (207)-866-2132.

Use of Technical Data

This report contains flood profiles, photo base flood plain maps, selected valley cross sections and other information which indicate the extent of potential flooding along the streams and ponds studied in the town of Union. Four floods were analyzed, the 10-year (10 percent chance) flood, 50-year (2 percent chance) flood, 100-year (1 percent chance) flood and the 500-year (0.2 percent chance) flood.

Information in the report pertaining to the Medomak River may also be used in the town of Washington. However, the extent of flooding in Washington has not been shown on the Flood Plain Maps.

The results of this study are summarized in the Flood Profiles which depict the elevations of the above four floods throughout the study area. The analyses do not account for the unpredictable obstructing effects of ice or other debris which could reduce the capacity of the channel and/or bridges during flooding conditions. Thus, the elevations presented in this report should be considered minimum for flood plain management purposes.

The Flood Plain Maps include a delineation of the 10-year, 100-year and 500-year flood boundaries and the 100-year flood elevations. Where these lines merge there is no appreciable difference in the flood boundaries.

Due to variations in relief and scale, the areas outlined on the maps are approximate. To check a specific property the user should locate the property in question on the appropriate Flood Plain Map and read the elevation for the desired frequency flood at the corresponding location on the Flood Profiles. Cross section locations, as shown on the maps and profiles, can be used as references for this purpose. By comparing the elevation from the profiles to the surveyed elevation of the property in question, the flooding frequency of that property can be estimated. Elevation bench marks, whose approximate locations are shown on the Flood Plain Map Index and Flood Plain Maps, are described in the Appendix and can be used as starting points to transfer elevations (NGVD) to the desired properties.

Also included are selected valley cross sections which show the relationship of various floods to existing topography under unobstructed flow conditions.

The following tables are contained in the Appendix:

Selected Flood Discharges - provides rates of flow in cubic feet per second for the 10-year, 50-year, 100-year, and 500-year floods within the study area. This data can be used as a guide for the hydraulic design of new bridges and/or stream channel modifications.

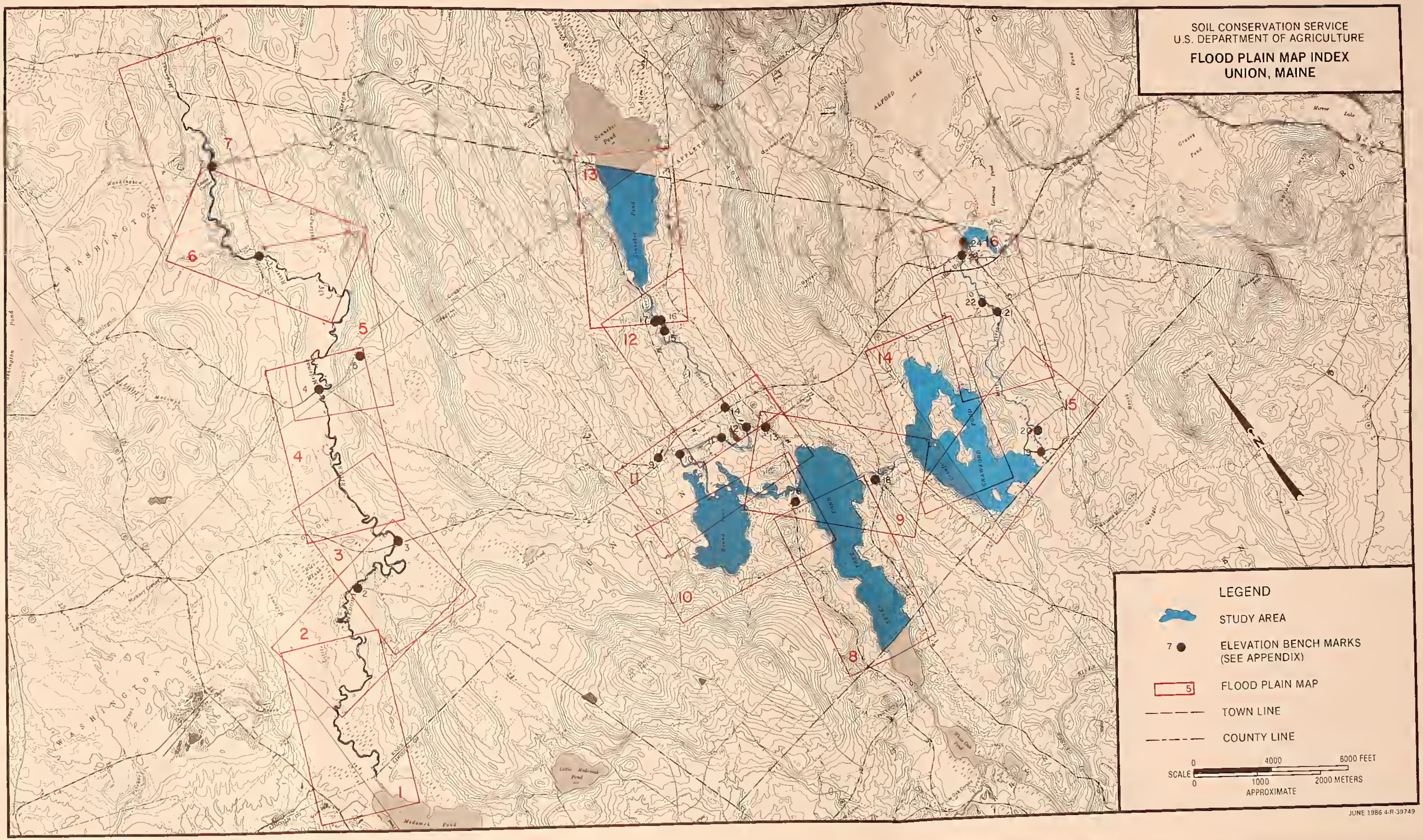
Bridge Data - presents a summary of flood and other elevations for bridges within the study area. This information can also be obtained from the Flood Profiles.

Pond Data - provides drainage areas and flood elevations for all ponds studied and the location of the nearest elevation bench marks, descriptions of which are included in the Appendix.

Dam Data - presents a summary of general data for all dams on the streams studied in Union. Included in this table are the dam's location, drainage area, type, height, if the dam has a fishway, and its present use.

Field surveys were obtained during the summers of 1981 and 1982. Only those features in the flood plain at the time the surveys were completed were considered in the computations.1/ Changes of bridge openings, dams and/or flood plain encroachment will affect flood levels and necessitate updating the information given in this report. Additionally, major changes in land use due to unforeseen future development within the watershed could cause a significant increase in flood discharges and require revisions in the data.

1/ This report reflects the removal of the Old State Route 17 bridge over the Medomak River.



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LEGEND

500 YEAR FLOOD PLAIN

100 YEAR FLOOD PLAIN

10 YEAR FLOOD PLAIN

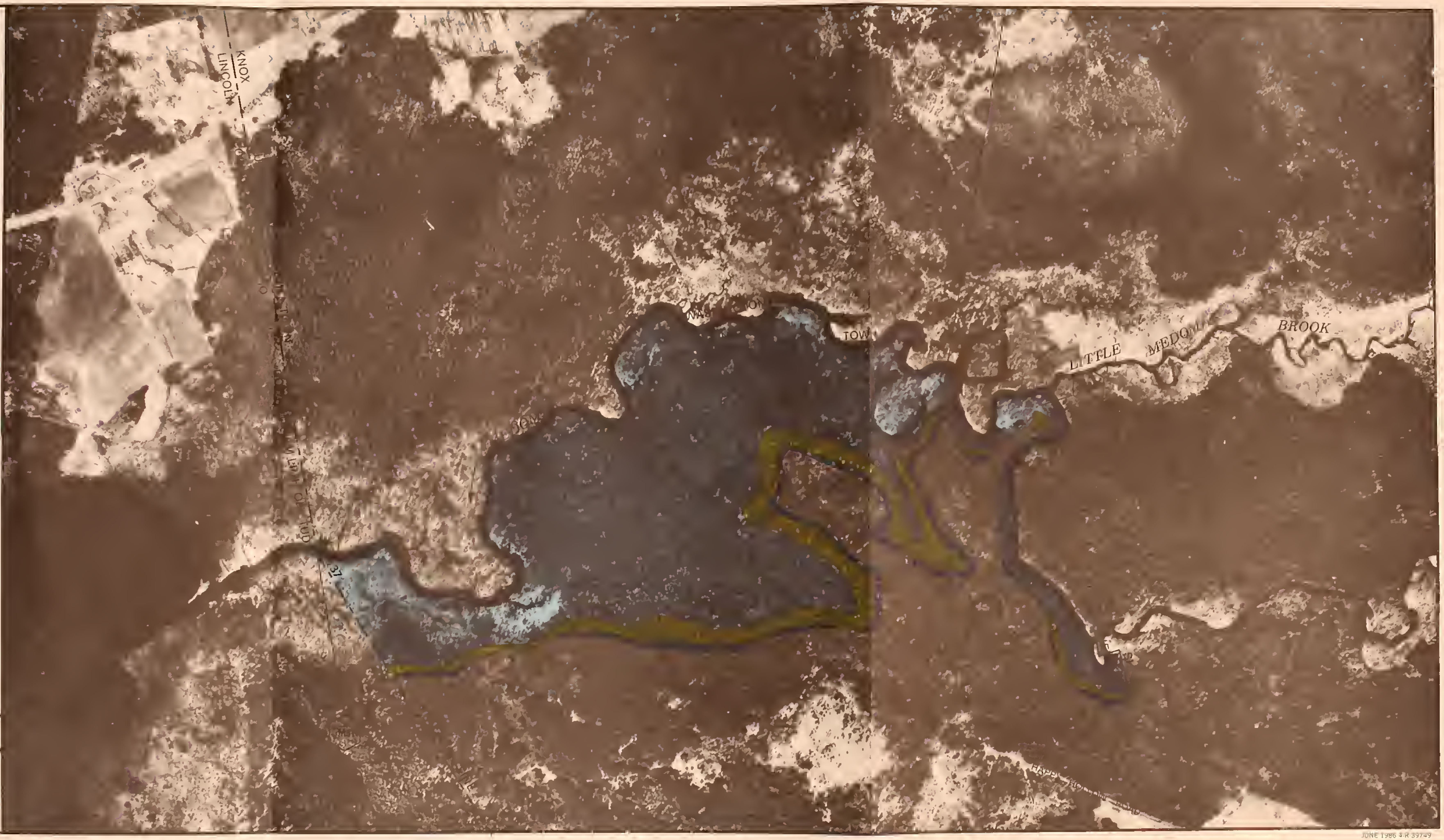
M1 VALLEY CROSS SECTION

25 100 YEAR FLOOD ELEV.

LIMITS OF FLOODING SHOWN MAY VARY FROM ACTUAL LOCATIONS ON THE GROUND AS EXPLAINED IN THE NARRATIVE.

N

SCALE 0 500 1000 FEET
0 100 200 300 METERS
APPROXIMATE



SOIL CONSERVATION SERVICE
U.S. DEPARTMENT OF AGRICULTURE

FLOOD PLAIN MAP
FLOOD PLAIN MANAGEMENT STUDY
TOWN OF UNION, MAINE

SHEET 1 OF 16

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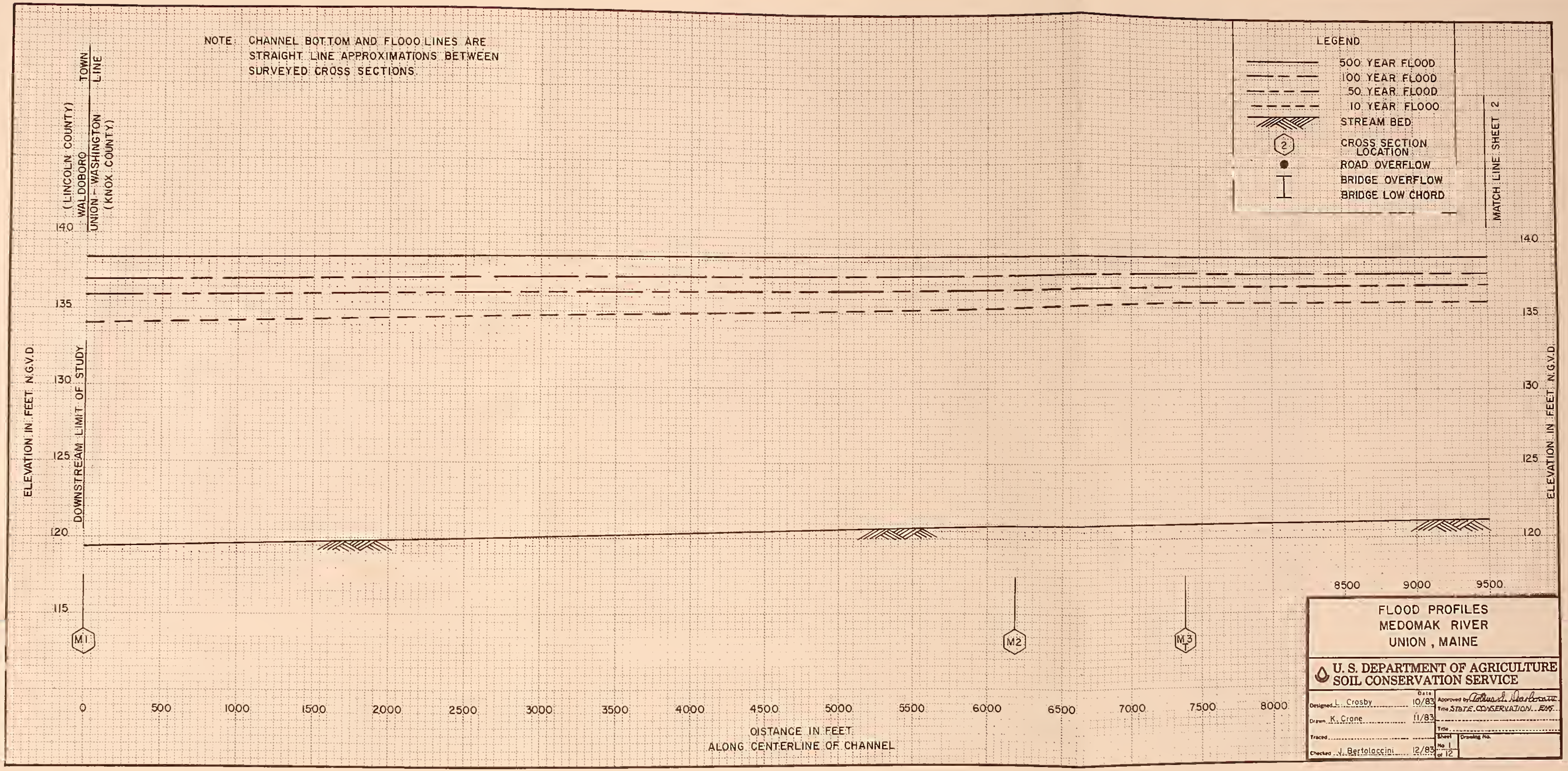
JUNE 1986 4-R-39749


NOTE: CHANNEL BOTTOM AND FLOOD LINES ARE STRAIGHT LINE APPROXIMATIONS BETWEEN SURVEYED CROSS SECTIONS
LEGEND
500 YEAR FLOOD
100 YEAR FLOOD
50 YEAR FLOOD
10 YEAR FLOOD
STREAM BED
CROSS SECTION LOCATION
ROAD OVERFLOW
BRIDGE OVERFLOW
BRIDGE LOW CHORD
TOWN LINE
(LINCOLN COUNTY) WALDOBORO
UNION - WASHINGTON (KNOX COUNTY)
DOWNSTREAM LIMIT OF STUDY
MATCH LINE SHEET 2
ELEVATION IN FEET N.G.V.D.
140
135
130
125
120
115
M1
M2
M3
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000
6500
7000
7500
8000
8500
9000
9500
DISTANCE IN FEET ALONG CENTERLINE OF CHANNEL
FLOOD PROFILES
MEDOMAK RIVER
UNION, MAINE
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
Designed L. Crosby 10/83
Drawn K. Crone 11/83
Traced
Checked J. Bertoloccini 12/83
Approved by
Title STATE CONSERVATION ENG.
Sheet No. 1 of 12
Drawing No.

LEGEND

- 500 YEAR FLOOO PLAIN
- 100 YEAR FLOOD PLAIN
- 10 YEAR FLOOD PLAIN
- M1 — VALLEY CROSS SECTION
- 25 — 100 YEAR FLOOO ELEV.

LIMITS OF FLOOOING SHOWN MAY VARY FROM ACTUAL LOCATIONS ON THE GROUND AS EXPLAINEO IN THE NARRATIVE.

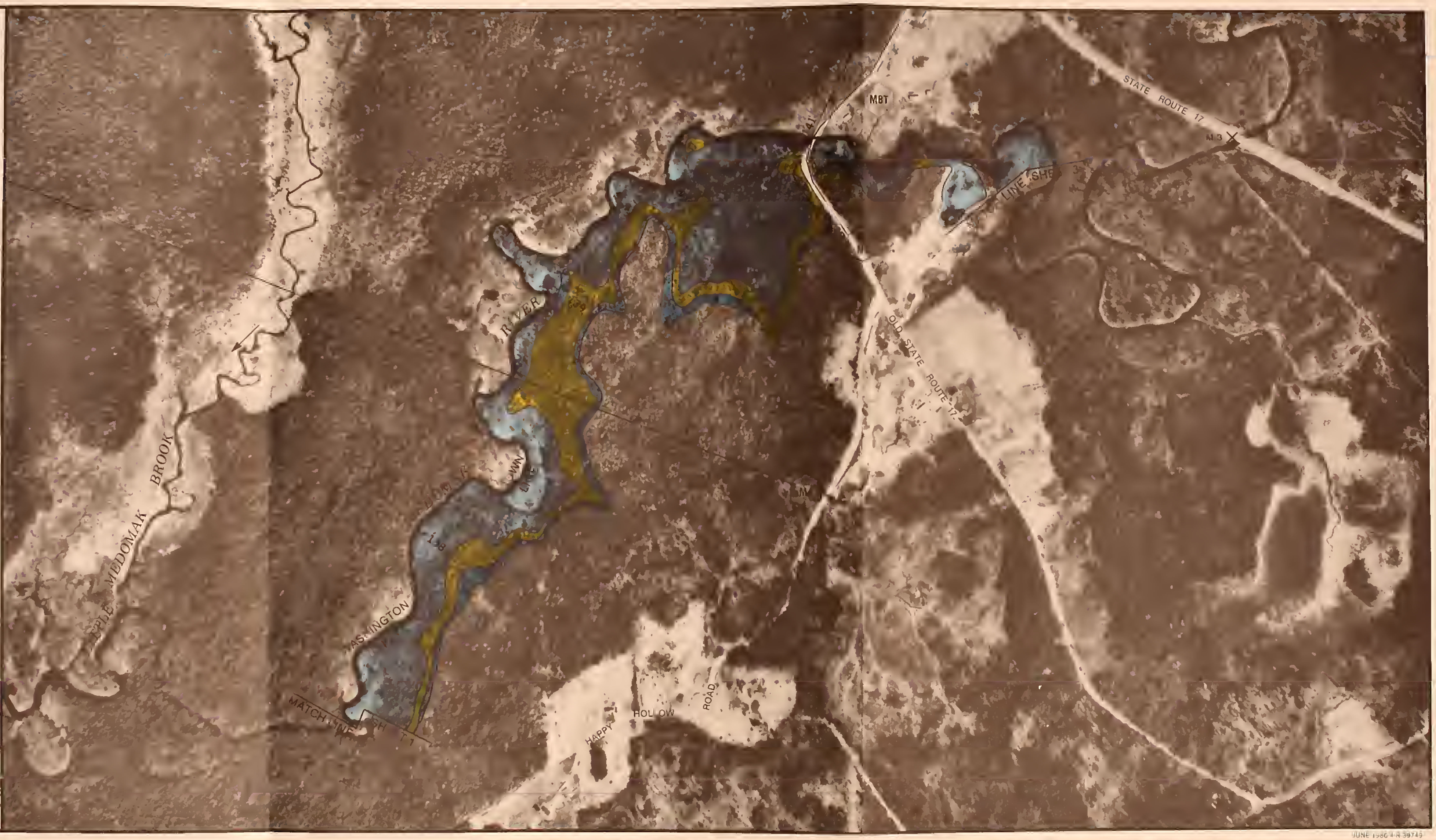
N

SCALE 0 — 500 — 1000 FEET
0 — 100 — 200 — 300 METERS
APPROXIMATE

SOIL CONSERVATION SERVICE
U.S. OEPARTMENT OF AGRICULTURE

FLOOD PLAIN MAP
FLOOD PLAIN MANAGEMENT STUDY
TOWN OF UNION, MAINE

SHEET 2 OF 16



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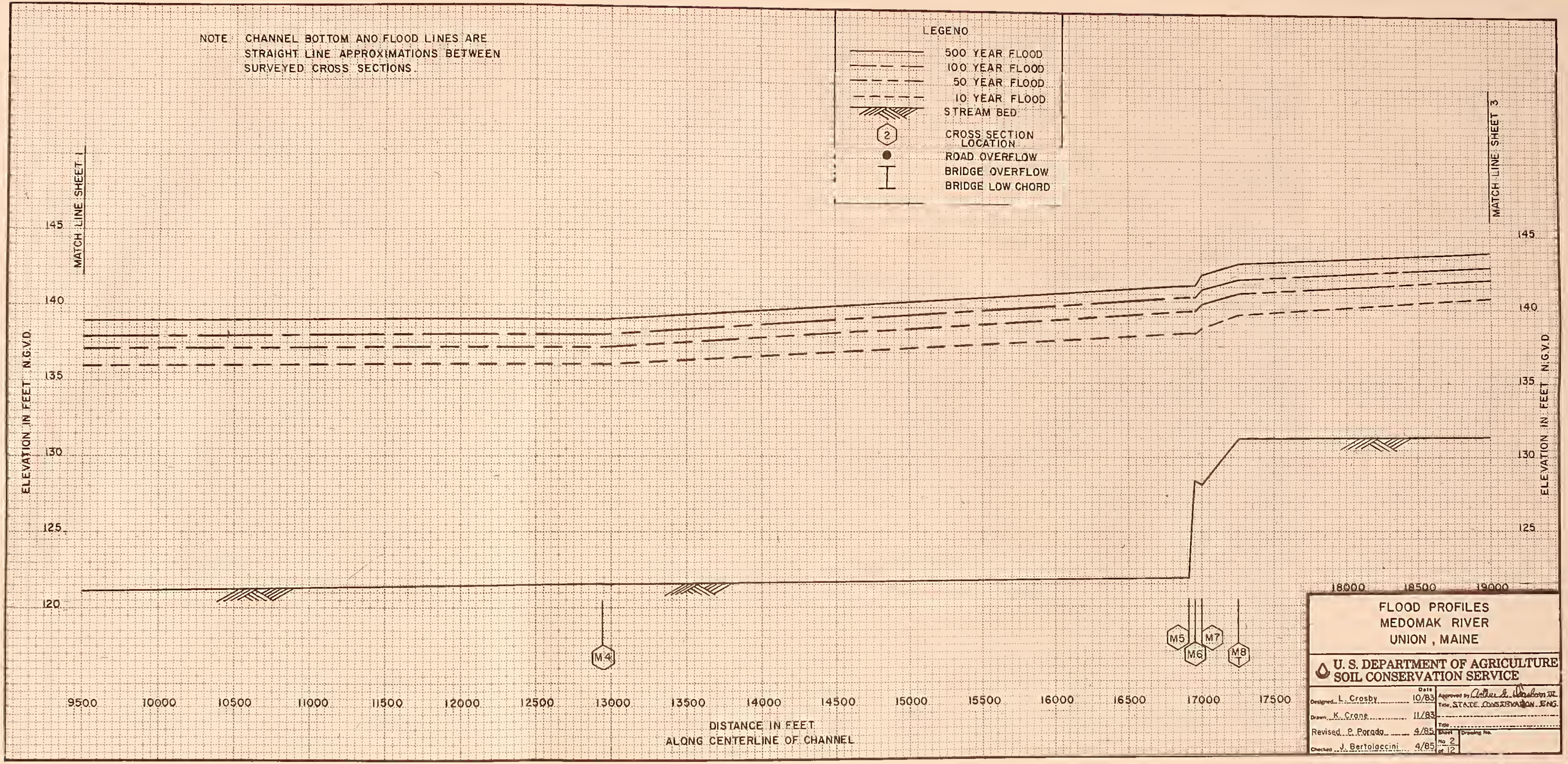
JUNE 1986 4-R-39749



NOTE: CHANNEL BOTTOM AND FLOOD LINES ARE STRAIGHT LINE APPROXIMATIONS BETWEEN SURVEYED CROSS SECTIONS.
LEGEND
500 YEAR FLOOD
100 YEAR FLOOD
50 YEAR FLOOD
10 YEAR FLOOD
STREAM BED
CROSS SECTION LOCATION
ROAD OVERFLOW
BRIDGE OVERFLOW
BRIDGE LOW CHORD
MATCH LINE SHEET 1
MATCH LINE SHEET 3
ELEVATION IN FEET N.G.V.D.
145
140
135
130
125
120
M4
M5
M6
M7
M8
9500
10000
10500
11000
11500
12000
12500
13000
13500
14000
14500
15000
15500
16000
16500
17000
17500
18000
18500
19000
DISTANCE IN FEET
ALONG CENTERLINE OF CHANNEL
FLOOD PROFILES
MEDOMAK RIVER
UNION, MAINE
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
Designed L. Crosby 10/83
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Revised P. Porado 4/85
Checked J. Bertolaccini 4/85
Title STATE CONSERVATION ENG.
No. 2 of 12

LEGENO

500 YEAR FLOOD PLAIN

100 YEAR FLOOD PLAIN

10 YEAR FLOOO PLAIN

M1 VALLEY CROSS SECTION

25 100 YEAR FLOOO ELEV.

LIMITS OF FLOOOING SHOWN MAY VARY FROM ACTUAL LOCATIONS ON THE GROUND AS EXPLAINEO IN THE NARRATIVE.

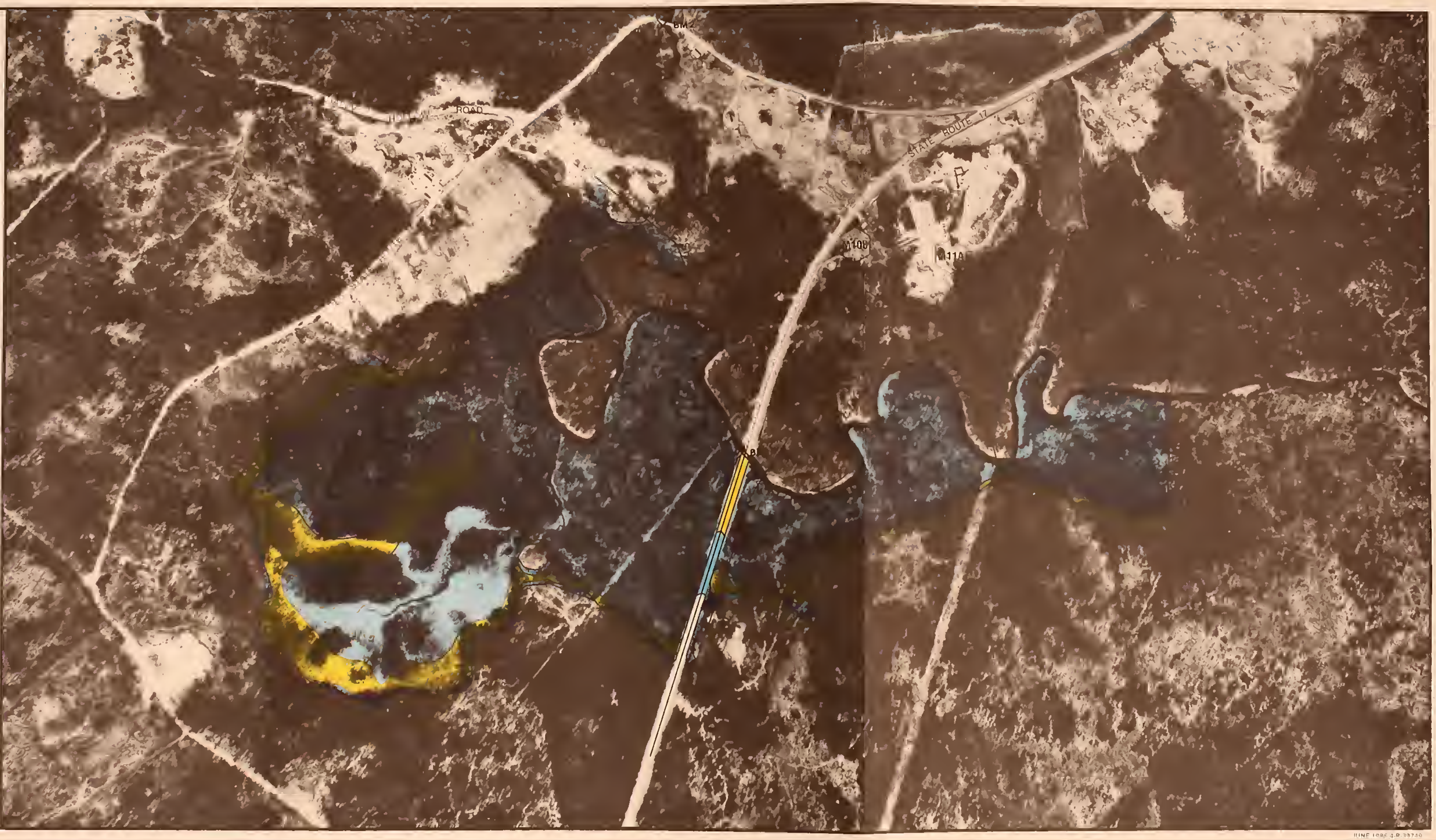
N

SCALE 0 500 1000 FEET
0 100 200 300 METERS
APPROXIMATE

SOIL CONSERVATION SERVICE
U.S. OEPARTMENT OF AGRICULTURE

FLOOD PLAIN MAP
FLOOD PLAIN MANAGEMENT STUDY
TOWN OF UNION, MAINE

SHEET 3 OF 16



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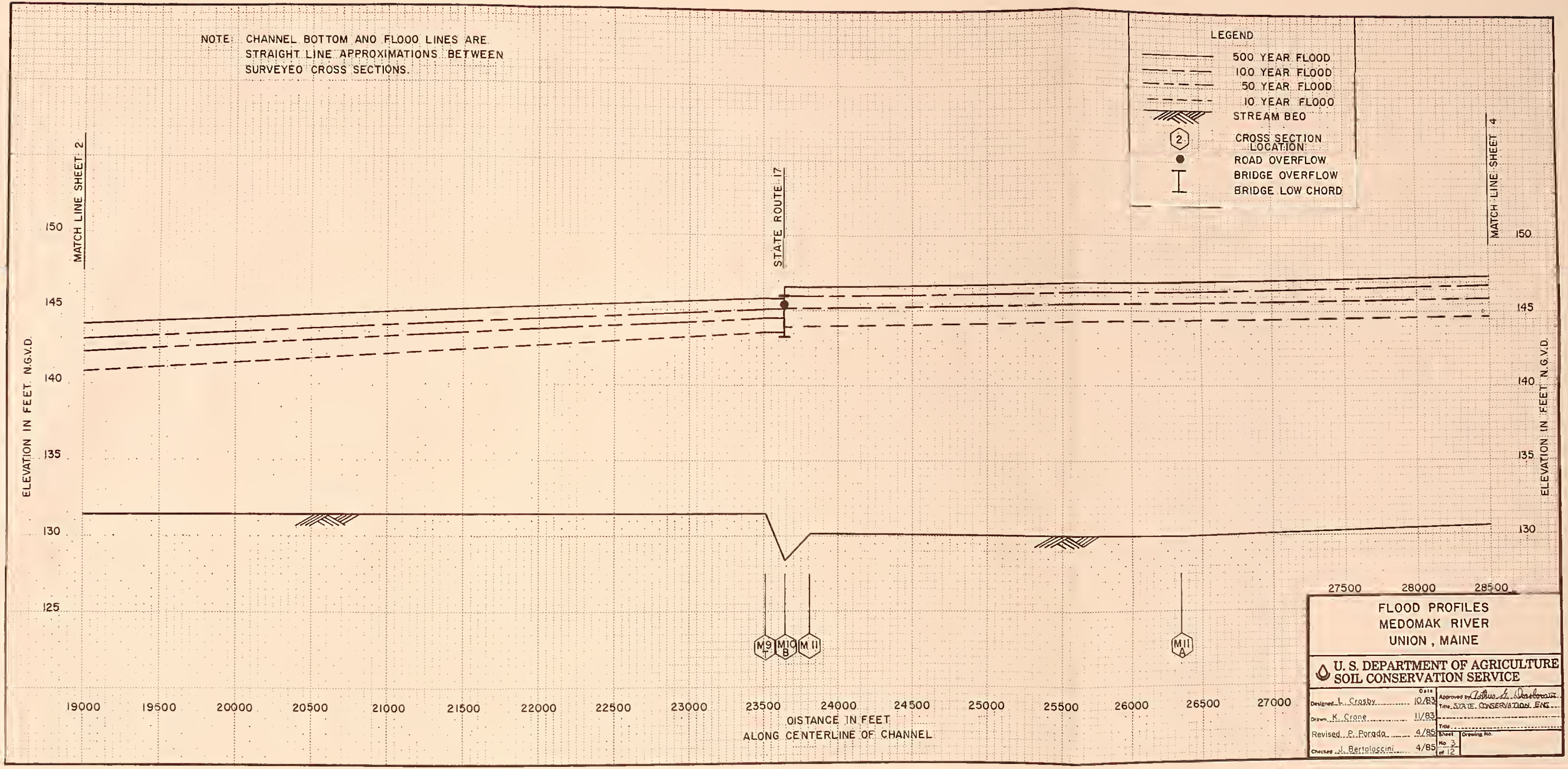
JUNE 1986 4-R-39740



NOTE: CHANNEL BOTTOM AND FLOOD LINES ARE STRAIGHT LINE APPROXIMATIONS BETWEEN SURVEYED CROSS SECTIONS.
LEGEND
500 YEAR FLOOD
100 YEAR FLOOD
50 YEAR FLOOD
10 YEAR FLOOD
STREAM BED
CROSS SECTION LOCATION
ROAD OVERFLOW
BRIDGE OVERFLOW
BRIDGE LOW CHORD
MATCH LINE SHEET 2
STATE ROUTE 17
MATCH LINE SHEET 4
ELEVATION IN FEET N.G.V.D.
150
145
140
135
130
125
M9 T
M10 B
M11
M11 A
19000
19500
20000
20500
21000
21500
22000
22500
23000
23500
24000
24500
25000
25500
26000
26500
27000
27500
28000
28500
DISTANCE IN FEET ALONG CENTERLINE OF CHANNEL
FLOOD PROFILES
MEDOMAK RIVER
UNION, MAINE
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
Designed L. Crosby 10/83
Drawn K. Crone 11/83
Revised P. Porada 4/85
Checked J. Bertoloccini 4/85
Approved by Arthur G. Dearborn
Title STATE CONSERVATION ENG.
Sheet No 3 of 12

LEGEND

500 YEAR FLOOD PLAIN

100 YEAR FLOOD PLAIN

10 YEAR FLOOD PLAIN

M1 VALLEY CROSS SECTION

25 100 YEAR FLOOD ELEV.

LIMITS OF FLOODING SHOWN MAY VARY FROM ACTUAL LOCATIONS ON THE GROUND AS EXPLAINED IN THE NARRATIVE.

N

SCALE 0 500 1000 FEET
0 100 200 300 METERS
APPROXIMATE

SOIL CONSERVATION SERVICE
U.S. DEPARTMENT OF AGRICULTURE

FLOOD PLAIN MAP
FLOOD PLAIN MANAGEMENT STUDY
TOWN OF UNION, MAINE

SHEET 4 OF 16

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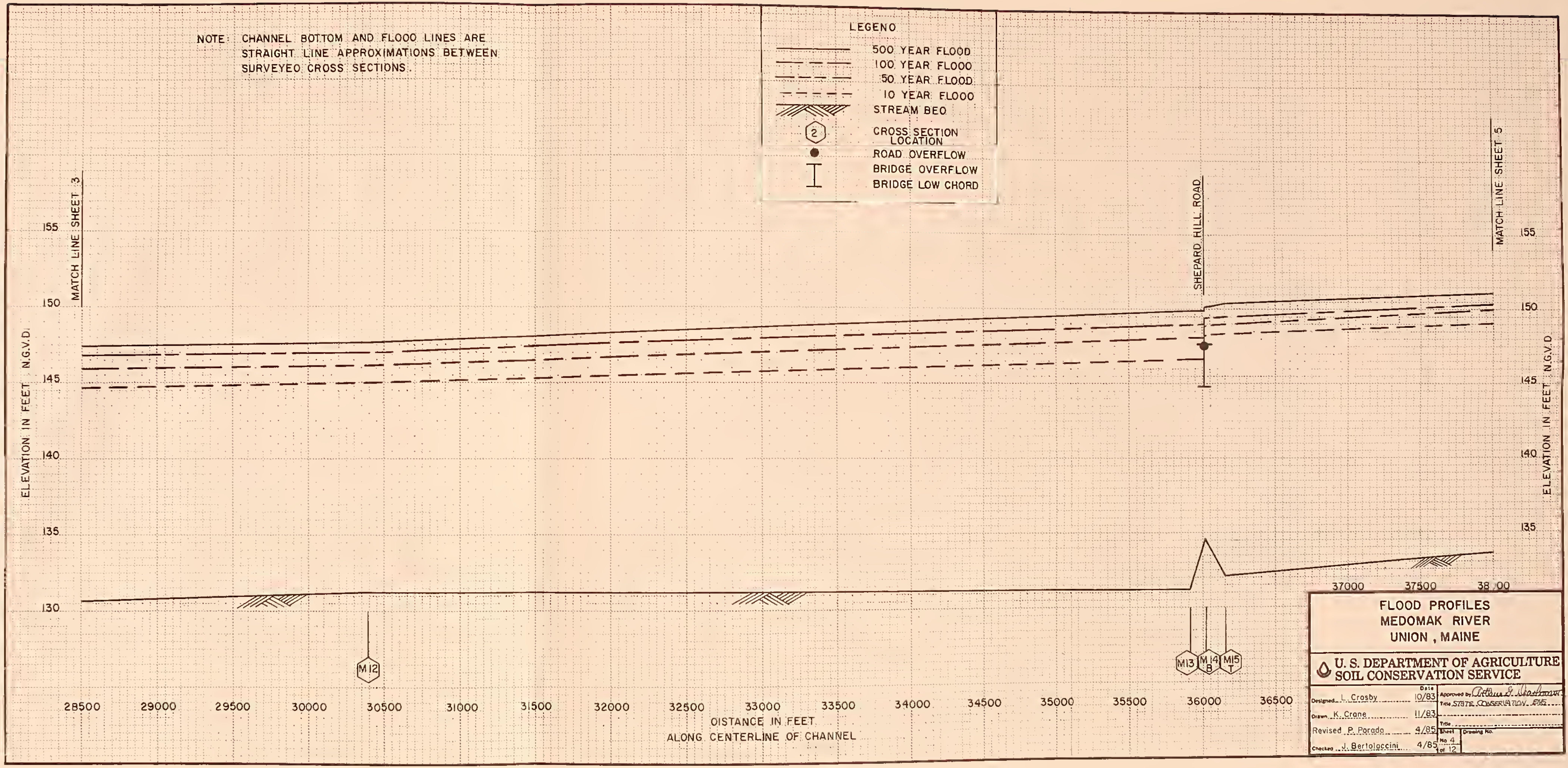

NOTE: CHANNEL BOTTOM AND FLOOD LINES ARE STRAIGHT LINE APPROXIMATIONS BETWEEN SURVEYED CROSS SECTIONS.
LEGEND
500 YEAR FLOOD
100 YEAR FLOOD
50 YEAR FLOOD
10 YEAR FLOOD
STREAM BED
CROSS SECTION LOCATION
ROAD OVERFLOW
BRIDGE OVERFLOW
BRIDGE LOW CHORD
MATCH LINE SHEET 3
SHEPARD HILL ROAD
MATCH LINE SHEET 5
ELEVATION IN FEET N.G.V.D.
155
150
145
140
135
130
M12
M13
M14 B
M15 T
28500
29000
29500
30000
30500
31000
31500
32000
32500
33000
33500
34000
34500
35000
35500
36000
36500
37000
37500
38000
DISTANCE IN FEET
ALONG CENTERLINE OF CHANNEL
FLOOD PROFILES
MEDOMAK RIVER
UNION, MAINE
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
Designed L. Crosby 10/83
Drawn K. Crane 11/83
Revised P. Porado 4/85
Checked J. Bertolaccini 4/85
Title STATE CONSERVATIONIST
Sheet No. 4 of 12
Drawing No.

LEGEND

500 YEAR FLOOD PLAIN

100 YEAR FLOOD PLAIN

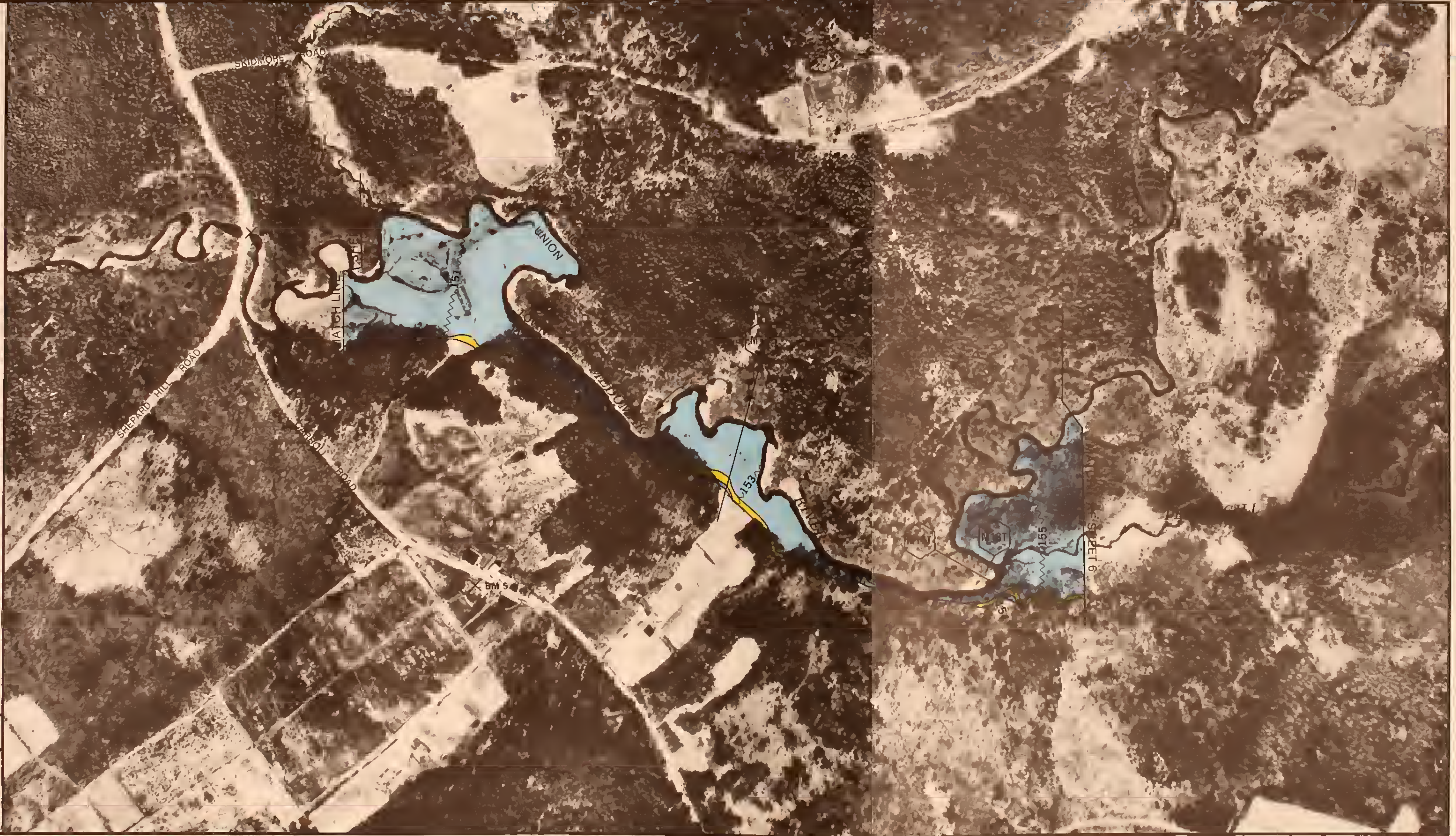
10 YEAR FLOOD PLAIN

(M1) VALLEY CROSS SECTION

25 100 YEAR FLOOD ELEV.

LIMITS OF FLOODING SHOWN MAY VARY FROM ACTUAL LOCATIONS ON THE GROUND AS EXPLAINED IN THE NARRATIVE.

SCALE 0 500 1000 FEET
0 100 200 300 METERS
APPROXIMATE



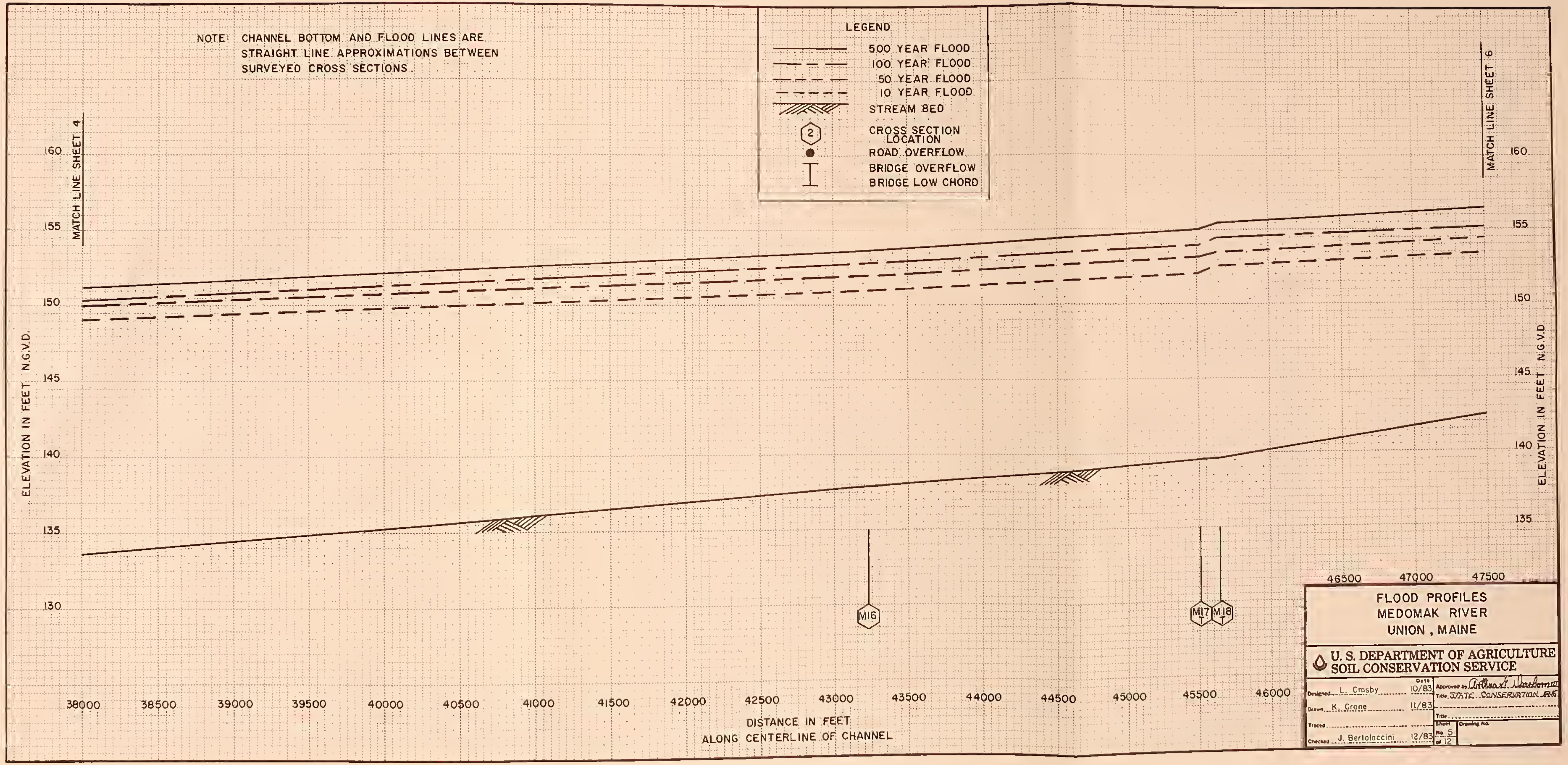
SOIL CONSERVATION SERVICE
U.S. DEPARTMENT OF AGRICULTURE

FLOOD PLAIN MAP
FLOOD PLAIN MANAGEMENT STUDY
TOWN OF UNION, MAINE

SHEET 5 OF 16

USDA-SCS-NATIONAL CARTOGRAPHIC CENTER, FT. WORTH, TX 1986

JUNE 1986 4-R-39749


NOTE: CHANNEL BOTTOM AND FLOOD LINES ARE STRAIGHT LINE APPROXIMATIONS BETWEEN SURVEYED CROSS SECTIONS.
LEGEND
500 YEAR FLOOD
100 YEAR FLOOD
50 YEAR FLOOD
10 YEAR FLOOD
STREAM BED
CROSS SECTION LOCATION
ROAD OVERFLOW
BRIDGE OVERFLOW
BRIDGE LOW CHORD
MATCH LINE SHEET 4
MATCH LINE SHEET 6
ELEVATION IN FEET N.G.V.D.
130
135
140
145
150
155
160
M16
M17
M18
38000
38500
39000
39500
40000
40500
41000
41500
42000
42500
43000
43500
44000
44500
45000
45500
46000
46500
47000
47500
DISTANCE IN FEET ALONG CENTERLINE OF CHANNEL
FLOOD PROFILES
MEDOMAK RIVER
UNION, MAINE
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
Designed L. Crosby 10/83
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Approved by
Title STATE CONSERVATIONIST
Sheet No. 5 of 12
Drawing No.

LEGEND

500 YEAR FLOOD PLAIN

100 YEAR FLOOD PLAIN

10 YEAR FLOOD PLAIN

M1 VALLEY CROSS SECTION

25 100 YEAR FLOOD ELEV.

LIMITS OF FLOODING SHOWN MAY VARY FROM ACTUAL LOCATIONS ON THE GROUND AS EXPLAINED IN THE NARRATIVE.

SCALE 0 500 1000 FEET

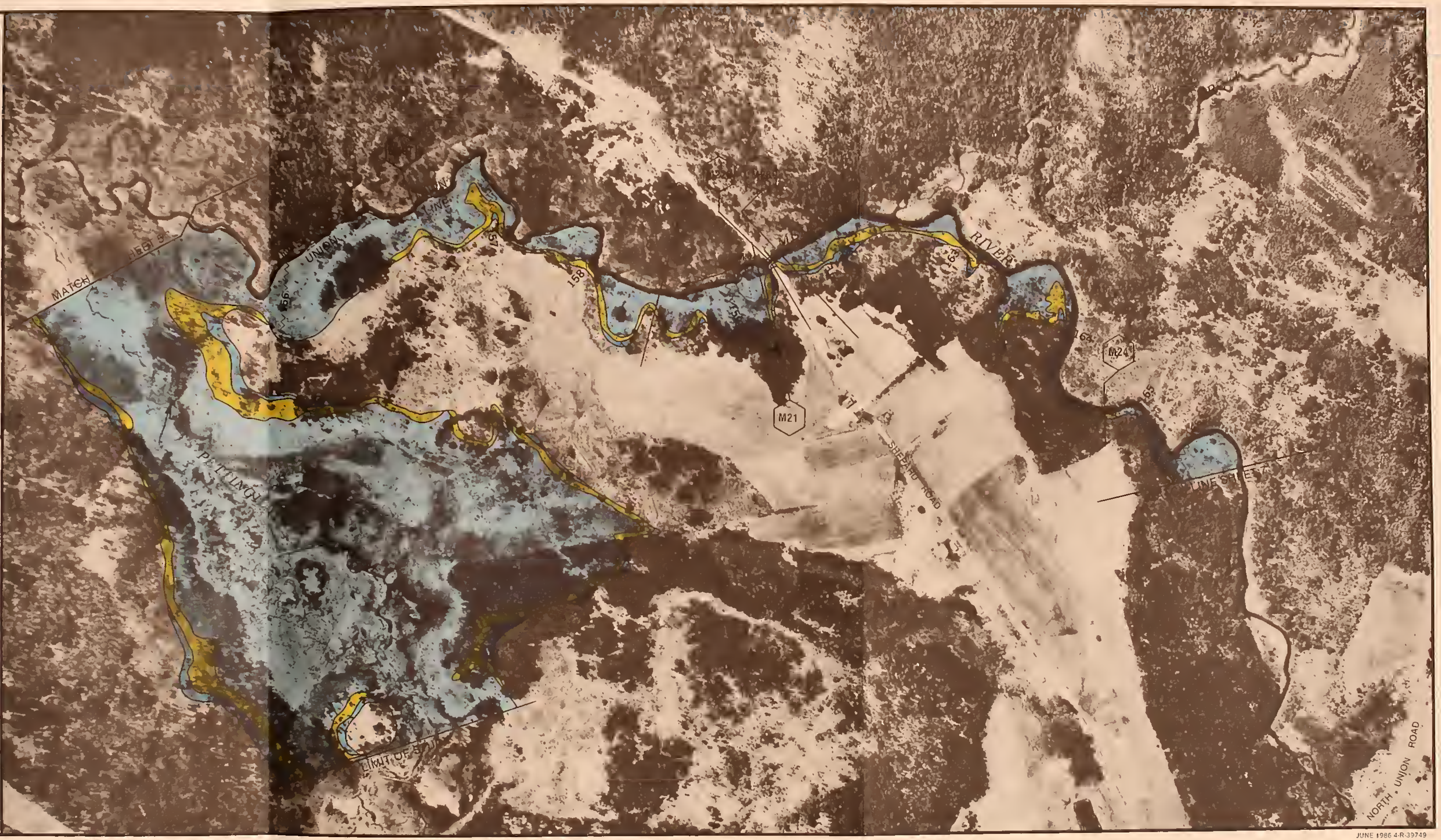
0 100 200 300 METERS

APPROXIMATE

SOIL CONSERVATION SERVICE
U.S. DEPARTMENT OF AGRICULTURE

FLOOD PLAIN MAP
FLOOD PLAIN MANAGEMENT STUDY
TOWN OF UNION, MAINE

SHEET 6 OF 16



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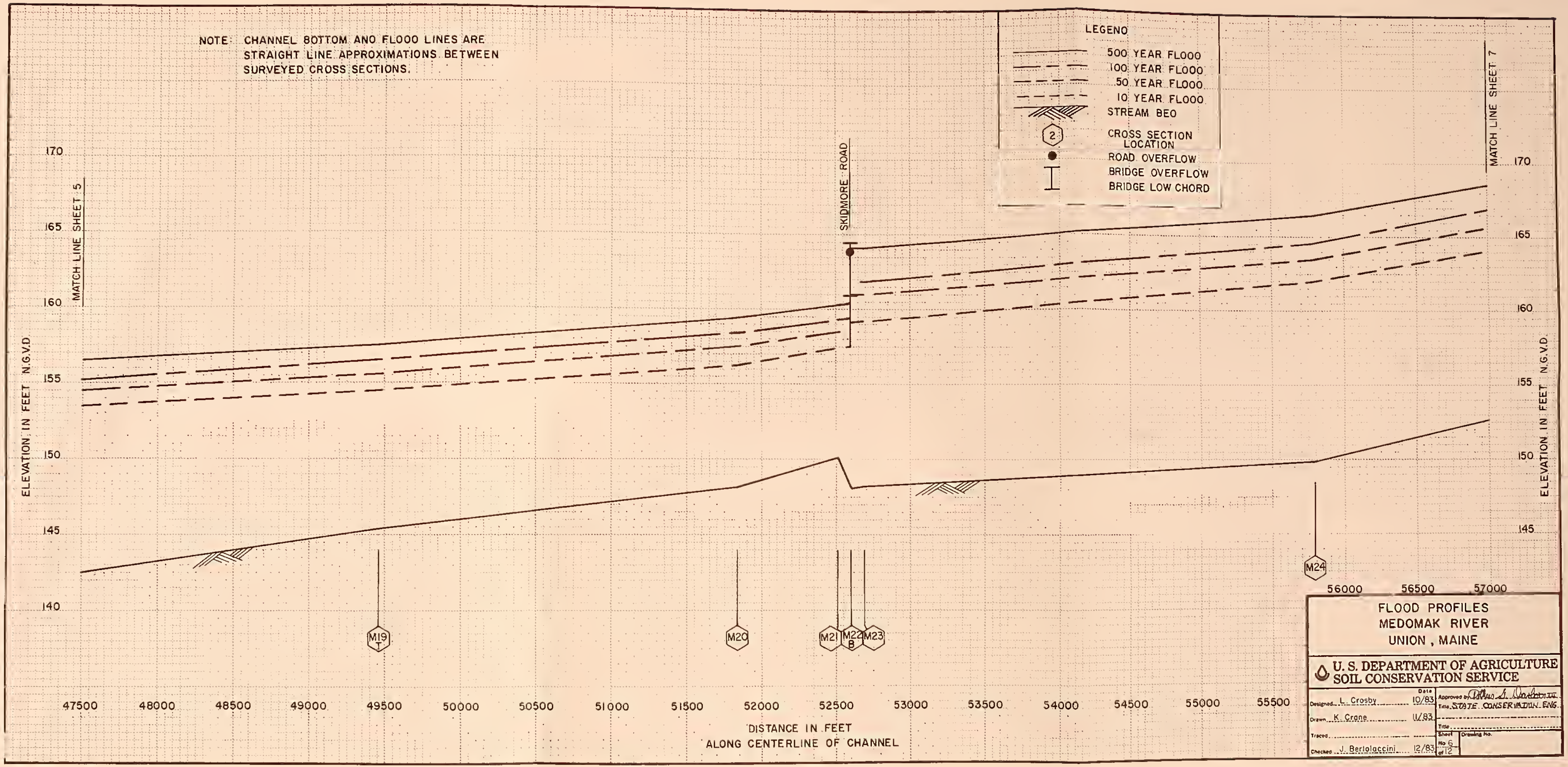
JUNE 1986 4-R-39749


NOTE: CHANNEL BOTTOM AND FLOOD LINES ARE STRAIGHT LINE APPROXIMATIONS BETWEEN SURVEYED CROSS SECTIONS.
LEGEND
500 YEAR FLOOD
100 YEAR FLOOD
50 YEAR FLOOD
10 YEAR FLOOD
STREAM BED
2
CROSS SECTION LOCATION
ROAD OVERFLOW
BRIDGE OVERFLOW
BRIDGE LOW CHORD
MATCH LINE SHEET 5
MATCH LINE SHEET 7
SKIDMORE ROAD
ELEVATION IN FEET N.G.V.D.
170
165
160
155
150
145
140
M19 T
M20
M21
M22 B
M23
M24
47500
48000
48500
49000
49500
50000
50500
51000
51500
52000
52500
53000
53500
54000
54500
55000
55500
56000
56500
57000
DISTANCE IN FEET ALONG CENTERLINE OF CHANNEL
FLOOD PROFILES
MEDOMAK RIVER
UNION, MAINE
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
Designed L. Crosby 10/83
Drawn K. Crane 11/83
Traced
Checked J. Bertolaccini 12/83
Approved by
Title STATE CONSERVATION ENG.
Sheet No. 6 of 12
Drawing No.

LEGEND

500 YEAR FLOOD PLAIN

100 YEAR FLOOD PLAIN

10 YEAR FLOOD PLAIN

M1 VALLEY CROSS SECTION

25 100 YEAR FLOOD ELEV.

LIMITS OF FLOODING SHOWN MAY VARY FROM ACTUAL LOCATIONS ON THE GROUND AS EXPLAINED IN THE NARRATIVE.

SCALE 0 500 1000 FEET

0 100 200 300 METERS

APPROXIMATE

SOIL CONSERVATION SERVICE
U.S. DEPARTMENT OF AGRICULTURE

FLOOD PLAIN MAP
FLOOD PLAIN MANAGEMENT STUDY
TOWN OF UNION, MAINE

SHEET 7 OF 16

USDA-SCS-NATIONAL CARTOGRAPHIC CENTER, FT. WORTH, TX, 1986

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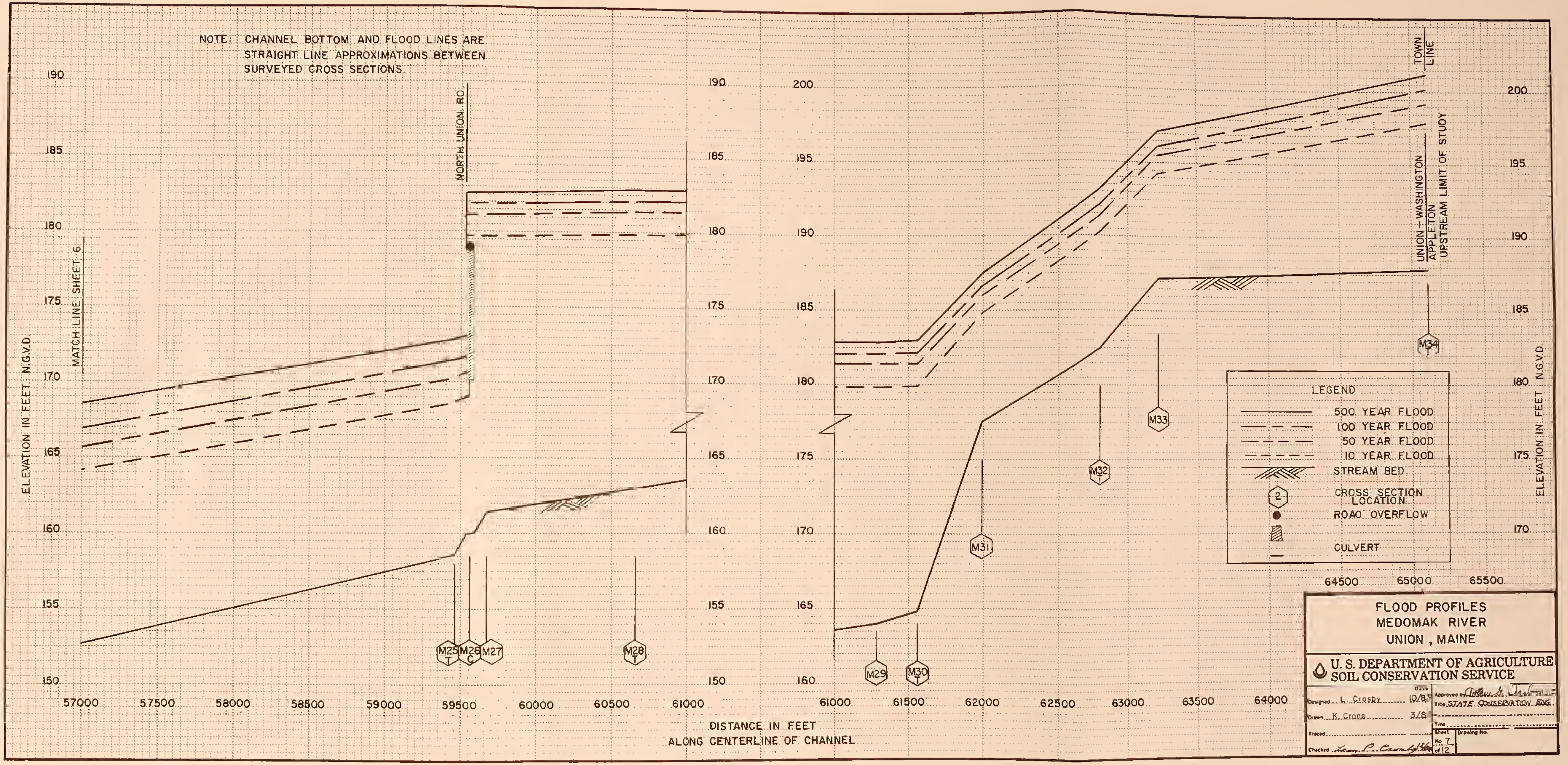
NOTE: CHANNEL BOTTOM AND FLOOD LINES ARE STRAIGHT LINE APPROXIMATIONS BETWEEN SURVEYED CROSS SECTIONS.
ELEVATION IN FEET N.G.V.D.
MATCH LINE SHEET 6
NORTH UNION RD.
TOWN LINE
UNION - WASHINGTON
APPLETON
UPSTREAM LIMIT OF STUDY
M25 T
M26 C
M27
M28 T
M29
M30 T
M31
M32 T
M33
M34 T
LEGEND
500 YEAR FLOOD
100 YEAR FLOOD
50 YEAR FLOOD
10 YEAR FLOOD
STREAM BED
CROSS SECTION LOCATION
ROAD OVERFLOW
CULVERT
DISTANCE IN FEET ALONG CENTERLINE OF CHANNEL
57000
57500
58000
58500
59000
59500
60000
60500
61000
61500
62000
62500
63000
63500
64000
64500
65000
65500
150
155
160
165
170
175
180
185
190
195
200
FLOOD PROFILES
MEDOMAK RIVER
UNION, MAINE
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
Designed L. Crosby
Drawn K. Crane
Traced
Checked
Approved by
Title STATE CONSERVATION ENG.
Sheet No. 7 of 12
Drawing No.

LEGEND

500 YEAR FLOOD PLAIN

100 YEAR FLOOD PLAIN

10 YEAR FLOOD PLAIN

M1 VALLEY CROSS SECTION

25 100 YEAR FLOOD ELEV.

LIMITS OF FLOODING SHOWN MAY VARY FROM ACTUAL LOCATIONS ON THE GROUND AS EXPLAINED IN THE NARRATIVE.

N

SCALE 0 500 1000 FEET
0 100 200 300 METERS
APPROXIMATE

SOIL CONSERVATION SERVICE
U.S. DEPARTMENT OF AGRICULTURE

FLOOD PLAIN MAP
FLOOD PLAIN MANAGEMENT STUDY
TOWN OF UNION, MAINE

SHEET 8 OF 16

USDA-SCS-NATIONAL CARTOGRAPHIC CENTER, FT. WORTH, TX 1986

JUNE 1986 4-R-39749

LEGEND

500 YEAR FLOOD PLAIN

100 YEAR FLOOD PLAIN

10 YEAR FLOOD PLAIN

M1 VALLEY CROSS SECTION

25 100 YEAR FLOOD ELEV.

LIMITS OF FLOODING SHOWN MAY VARY FROM ACTUAL LOCATIONS ON THE GROUND AS EXPLAINED IN THE NARRATIVE.

N

SCALE 0 500 1000 FEET

0 100 200 300 METERS

APPROXIMATE

SOIL CONSERVATION SERVICE
U.S. DEPARTMENT OF AGRICULTURE

FLOOD PLAIN MAP
FLOOD PLAIN MANAGEMENT STUDY
TOWN OF UNION, MAINE

SHEET 9 OF 16

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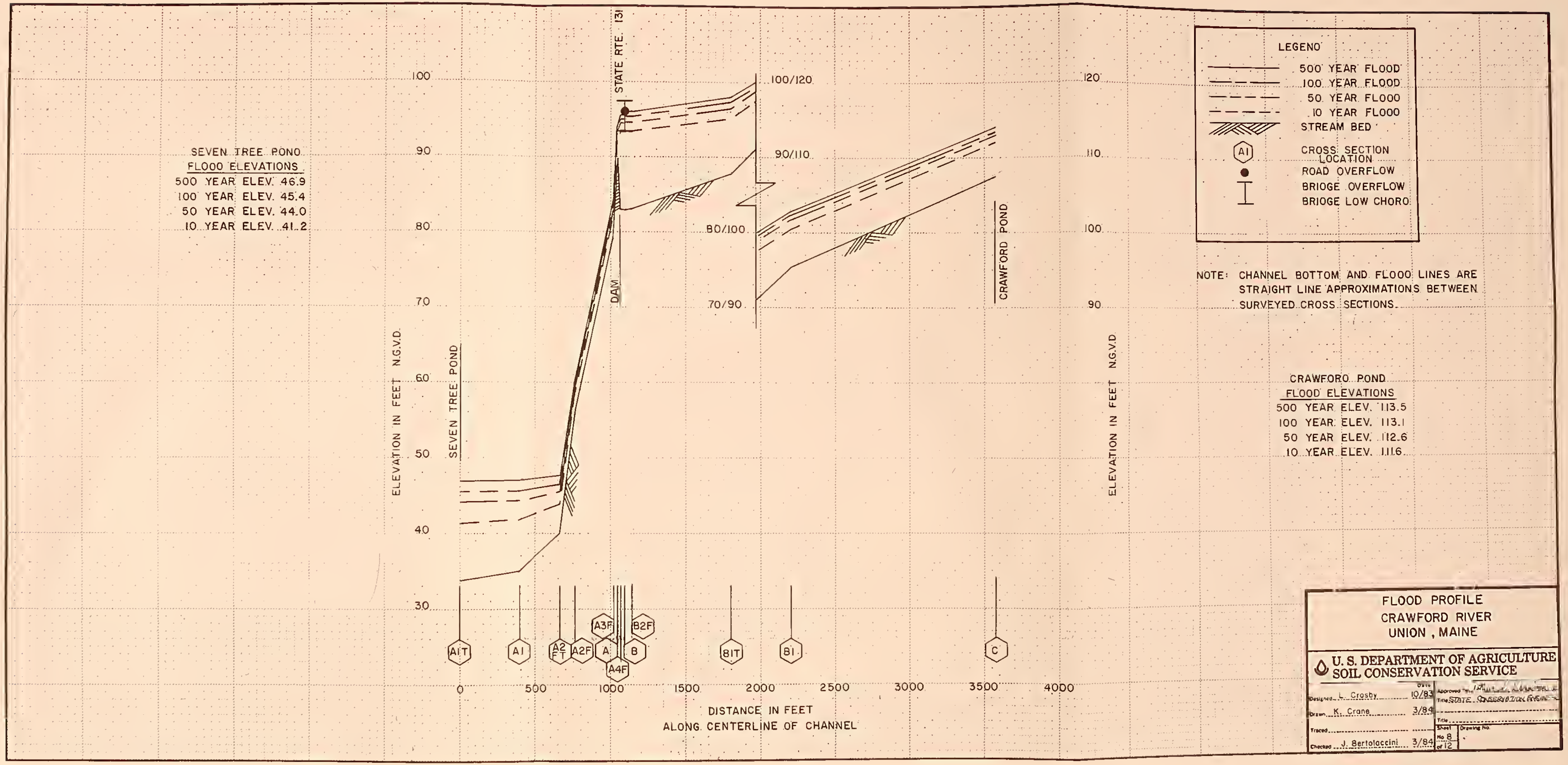


LEGEND
500 YEAR FLOOD
100 YEAR FLOOD
50 YEAR FLOOD
10 YEAR FLOOD
STREAM BED
CROSS SECTION LOCATION
ROAD OVERFLOW
BRIDGE OVERFLOW
BRIDGE LOW CHORD
NOTE: CHANNEL BOTTOM AND FLOOD LINES ARE STRAIGHT LINE APPROXIMATIONS BETWEEN SURVEYED CROSS SECTIONS.
SEVEN TREE POND FLOOD ELEVATIONS
500 YEAR ELEV. 46.9
100 YEAR ELEV. 45.4
50 YEAR ELEV. 44.0
10 YEAR ELEV. 41.2
CRAWFORD POND FLOOD ELEVATIONS
500 YEAR ELEV. 113.5
100 YEAR ELEV. 113.1
50 YEAR ELEV. 112.6
10 YEAR ELEV. 111.6
ELEVATION IN FEET N.G.V.D.
SEVEN TREE POND
STATE RTE. 131
DAM
CRAWFORD POND
100/120
90/110
80/100
70/90
A1T
A1
A2FT
A2F
A
A3F
A4F
B
B2F
B1T
B1
C
DISTANCE IN FEET ALONG CENTERLINE OF CHANNEL
FLOOD PROFILE
CRAWFORD RIVER
UNION , MAINE
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
Designed L. Crosby 10/83
Drawn K. Crane 3/84
Traced
Checked J. Bertolaccini 3/84
Sheet No. 8 of 12

LEGEND

500 YEAR FLOOD PLAIN

100 YEAR FLOOD PLAIN

10 YEAR FLOOD PLAIN

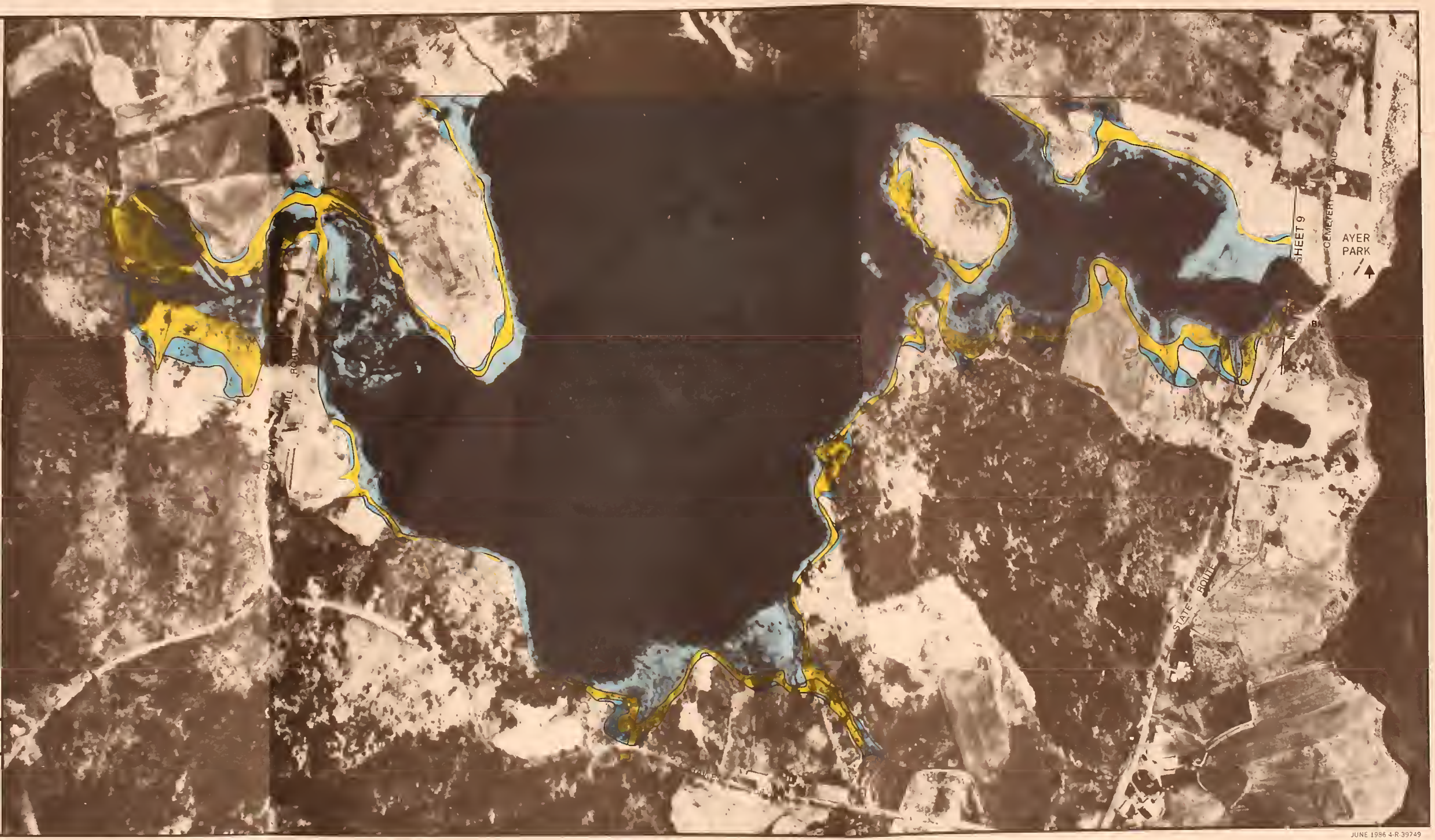
M1 VALLEY CROSS SECTION

25 100 YEAR FLOOD ELEV.

LIMITS OF FLOODING SHOWN MAY VARY FROM ACTUAL LOCATIONS ON THE GROUND AS EXPLAINED IN THE NARRATIVE.

N

SCALE 0 500 1000 FEET
0 100 200 300 METERS
APPROXIMATE



SOIL CONSERVATION SERVICE
U.S. DEPARTMENT OF AGRICULTURE

FLOOD PLAIN MAP
FLOOD PLAIN MANAGEMENT STUDY
TOWN OF UNION, MAINE

SHEET 10 OF 16

USDA SCS-NATIONAL CARTOGRAPHIC CENTER, FT. WORTH, TX 1986

JUNE 1986 4-R 39749

LEGEND

500 YEAR FLOOD PLAIN

100 YEAR FLOOD PLAIN

10 YEAR FLOOD PLAIN

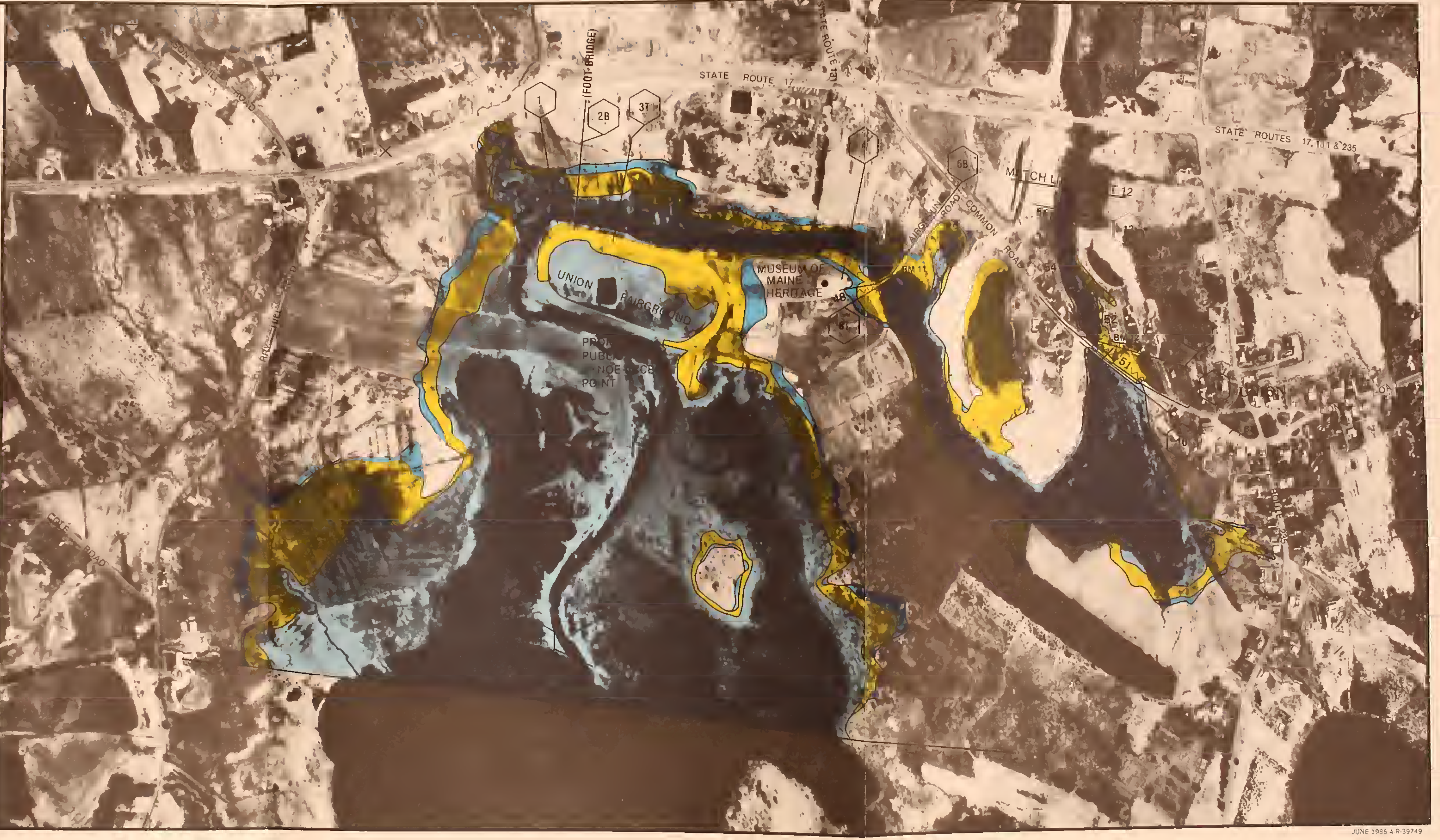
M1 VALLEY CROSS SECTION

25 100 YEAR FLOOD ELEV.

LIMITS OF FLOODING SHOWN MAY VARY FROM ACTUAL LOCATIONS ON THE GROUND AS EXPLAINED IN THE NARRATIVE.

N

SCALE 0 500 1000 FEET
0 100 200 300 METERS
APPROXIMATE



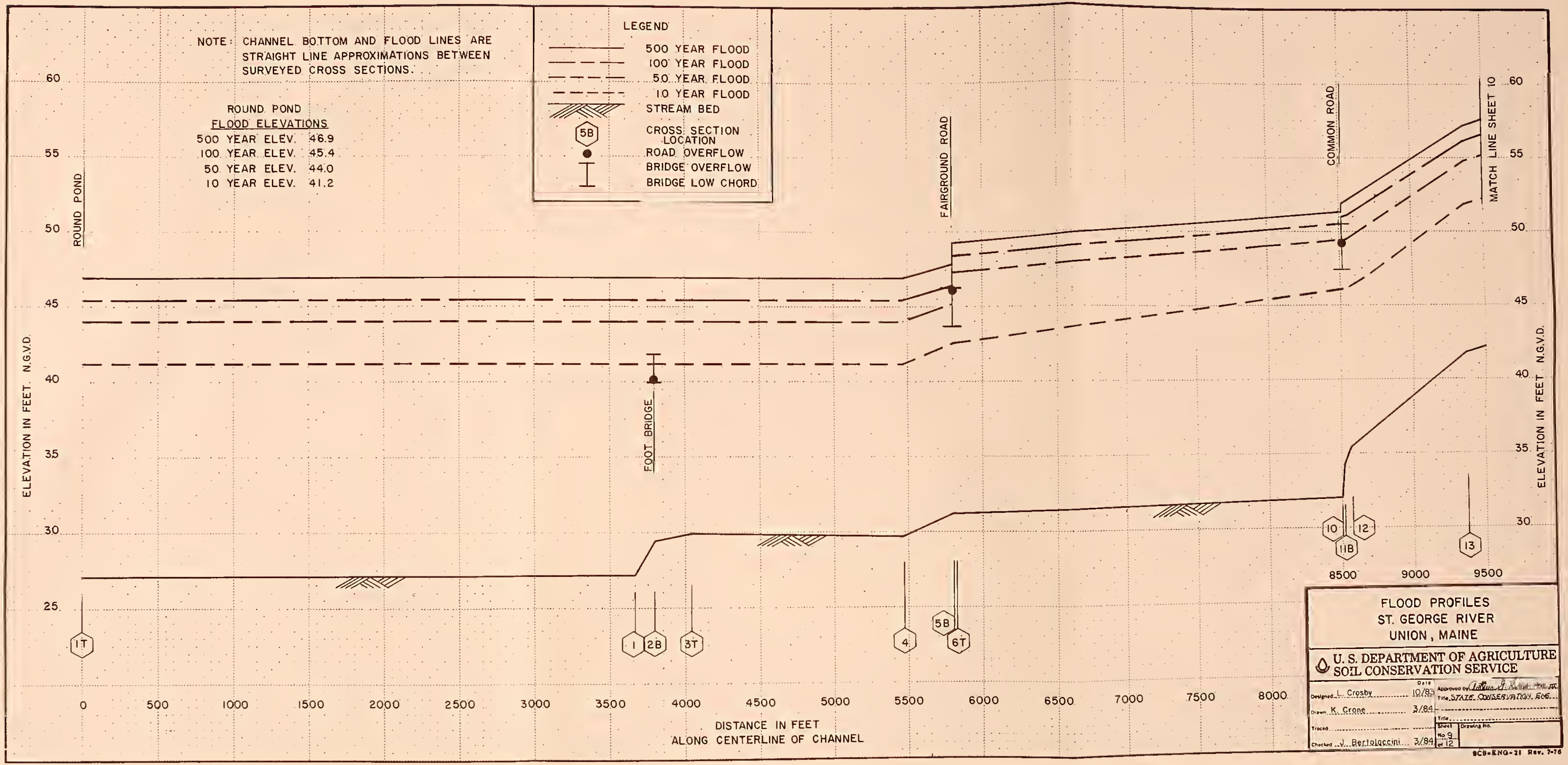
SOIL CONSERVATION SERVICE
U.S. DEPARTMENT OF AGRICULTURE

FLOOD PLAIN MAP
FLOOD PLAIN MANAGEMENT STUDY
TOWN OF UNION, MAINE

SHEET 11 OF 16

USDA-SCS-NATIONAL CARTOGRAPHIC CENTER, FT. WORTH, TX 1985

JUNE 1986 4-R-39749


NOTE: CHANNEL BOTTOM AND FLOOD LINES ARE STRAIGHT LINE APPROXIMATIONS BETWEEN SURVEYED CROSS SECTIONS.
ROUND POND
FLOOD ELEVATIONS
500 YEAR ELEV. 46.9
100 YEAR ELEV. 45.4
50 YEAR ELEV. 44.0
10 YEAR ELEV. 41.2
LEGEND
500 YEAR FLOOD
100 YEAR FLOOD
50 YEAR FLOOD
10 YEAR FLOOD
STREAM BED
5B
CROSS SECTION LOCATION
ROAD OVERFLOW
BRIDGE OVERFLOW
BRIDGE LOW CHORD
ROUND POND
FOOT BRIDGE
FAIRGROUND ROAD
COMMON ROAD
MATCH LINE SHEET 10
ELEVATION IN FEET N.G.V.D.
60
55
50
45
40
35
30
25
1T
1
2B
3T
4
5B
6T
10
11B
12
13
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000
6500
7000
7500
8000
8500
9000
9500
DISTANCE IN FEET
ALONG CENTERLINE OF CHANNEL
FLOOD PROFILES
ST. GEORGE RIVER
UNION, MAINE
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
Designed L. Crosby 10/83
Drawn K. Crane 3/84
Traced
Checked J. Bertolaccini 3/84
Approved by
Title STATE CONSERVATION. ENG.
Sheet No. 9 of 12
Drawing No.
SCS-ENG-21 Rev. 7-76

LEGEND

- 500 YEAR FLOOD PLAIN
- 100 YEAR FLOOD PLAIN
- 10 YEAR FLOOD PLAIN
- M1 VALLEY CROSS SECTION
- 25 100 YEAR FLOOD ELEV.

LIMITS OF FLOODING SHOWN MAY VARY FROM ACTUAL LOCATIONS ON THE GROUND AS EXPLAINED IN THE NARRATIVE.

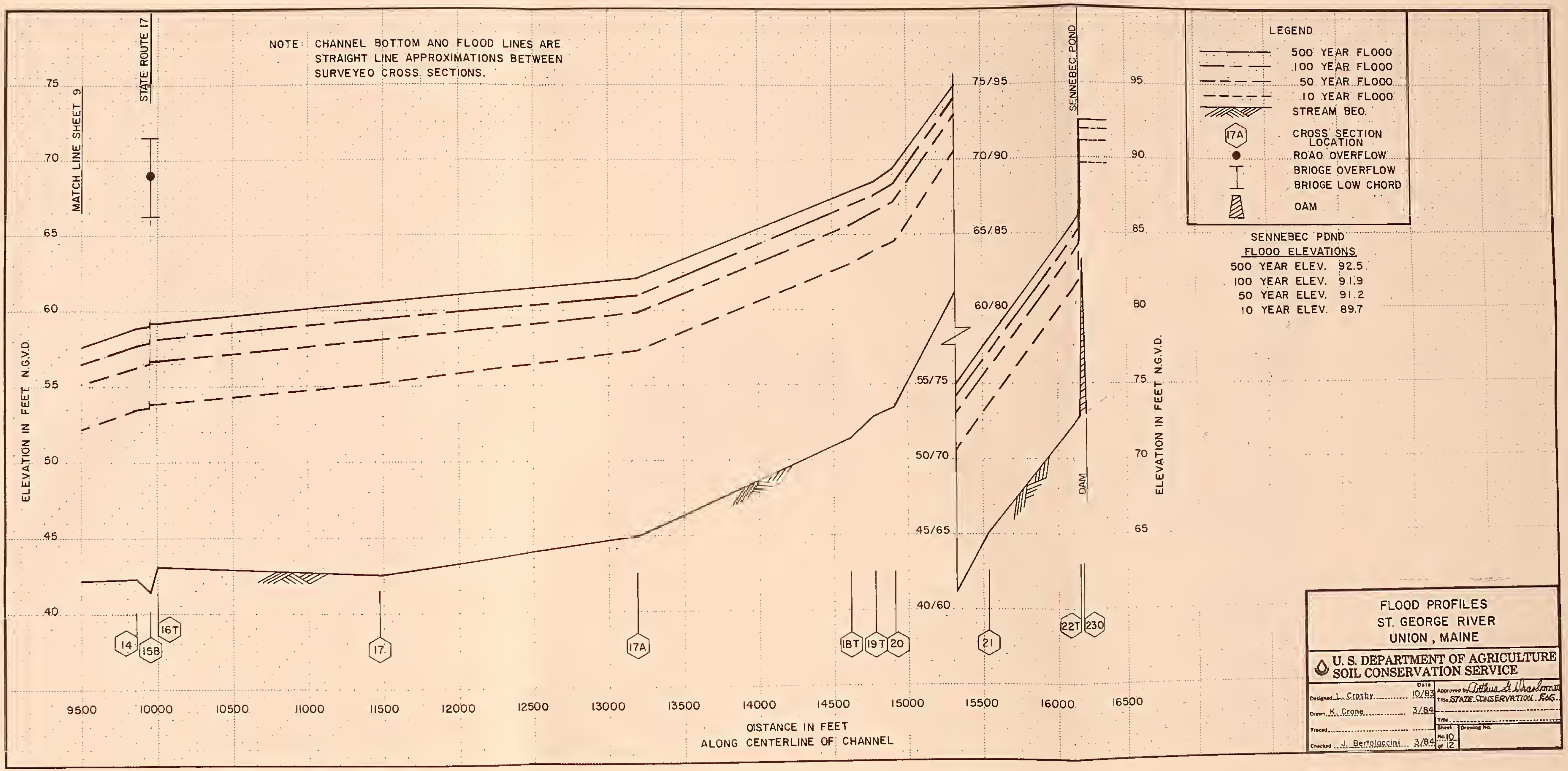
N

SCALE 0 500 1000 FEET
0 100 200 300 METERS
APPROXIMATE

SOIL CONSERVATION SERVICE
U.S. DEPARTMENT OF AGRICULTURE

FLOOD PLAIN MAP
FLOOD PLAIN MANAGEMENT STUDY
TOWN OF UNION, MAINE

SHEET 12 OF 15



NOTE: CHANNEL BOTTOM AND FLOOD LINES ARE STRAIGHT LINE APPROXIMATIONS BETWEEN SURVEYED CROSS SECTIONS.
MATCH LINE SHEET 9
STATE ROUTE 17
SENNEBEC POND
DAM
LEGEND
500 YEAR FLOOD
100 YEAR FLOOD
50 YEAR FLOOD
10 YEAR FLOOD
STREAM BED
CROSS SECTION LOCATION
ROAD OVERFLOW
BRIDGE OVERFLOW
BRIDGE LOW CHORD
DAM
SENNEBEC POND
FLOOD ELEVATIONS
500 YEAR ELEV. 92.5
100 YEAR ELEV. 91.9
50 YEAR ELEV. 91.2
10 YEAR ELEV. 89.7
ELEVATION IN FEET N.G.V.D.
75
70
65
60
55
50
45
40
75/95
70/90
65/85
60/80
55/75
50/70
45/65
40/60
95
90
85
80
75
70
65
14
15B
16T
17
17A
18T
19T
20
21
22T
23D
9500
10000
10500
11000
11500
12000
12500
13000
13500
14000
14500
15000
15500
16000
16500
DISTANCE IN FEET
ALONG CENTERLINE OF CHANNEL
FLOOD PROFILES
ST. GEORGE RIVER
UNION, MAINE
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
Designed L. Crosby 10/83
Drawn K. Crone 3/84
Traced
Checked J. Bertolaccini 3/84
Approved by Arthur S. Dracobonski
Title STATE CONSERVATION. ENG.
Sheet No. 10 of 12

LEGEND

500 YEAR FLOOD PLAIN

100 YEAR FLOOD PLAIN

10 YEAR FLOOD PLAIN

M1 VALLEY CROSS SECTION

25 100 YEAR FLOOD ELEV.

LIMITS OF FLOODING SHOWN MAY VARY FROM ACTUAL LOCATIONS ON THE GROUND AS EXPLAINED IN THE NARRATIVE.

N

SCALE 0 500 1000 FEET
0 100 200 300 METERS
APPROXIMATE

SOIL CONSERVATION SERVICE
U.S. DEPARTMENT OF AGRICULTURE

FLOOD PLAIN MAP

FLOOD PLAIN MANAGEMENT STUDY
TOWN OF UNION, MAINE

SHEET 13 OF 16

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JUNE 1986 4-R-39749

LEGEND

500 YEAR FLOOD PLAIN

100 YEAR FLOOD PLAIN

10 YEAR FLOOD PLAIN

M1 VALLEY CROSS SECTION

25 100 YEAR FLOOD ELEV.

LIMITS OF FLOODING SHOWN MAY VARY FROM ACTUAL LOCATIONS ON THE GROUND AS EXPLAINED IN THE NARRATIVE.

N

SCALE 0 500 1000 FEET

0 100 200 300 METERS

SOIL CONSERVATION SERVICE
U.S. DEPARTMENT OF AGRICULTURE

FLOOD PLAIN MAP

FLOOD PLAIN MANAGEMENT STUDY
TOWN OF UNION, MAINE

LEGEND

500 YEAR FLOOD PLAIN

100 YEAR FLOOD PLAIN

10 YEAR FLOOD PLAIN

M1 VALLEY CROSS SECTION

25 100 YEAR FLOOD ELEV.

LIMITS OF FLOODING SHOWN MAY VARY FROM ACTUAL LOCATIONS ON THE GROUND AS EXPLAINED IN THE NARRATIVE.

N

SCALE 0 500 1000 FEET

0 100 200 300 METERS

APPROXIMATE

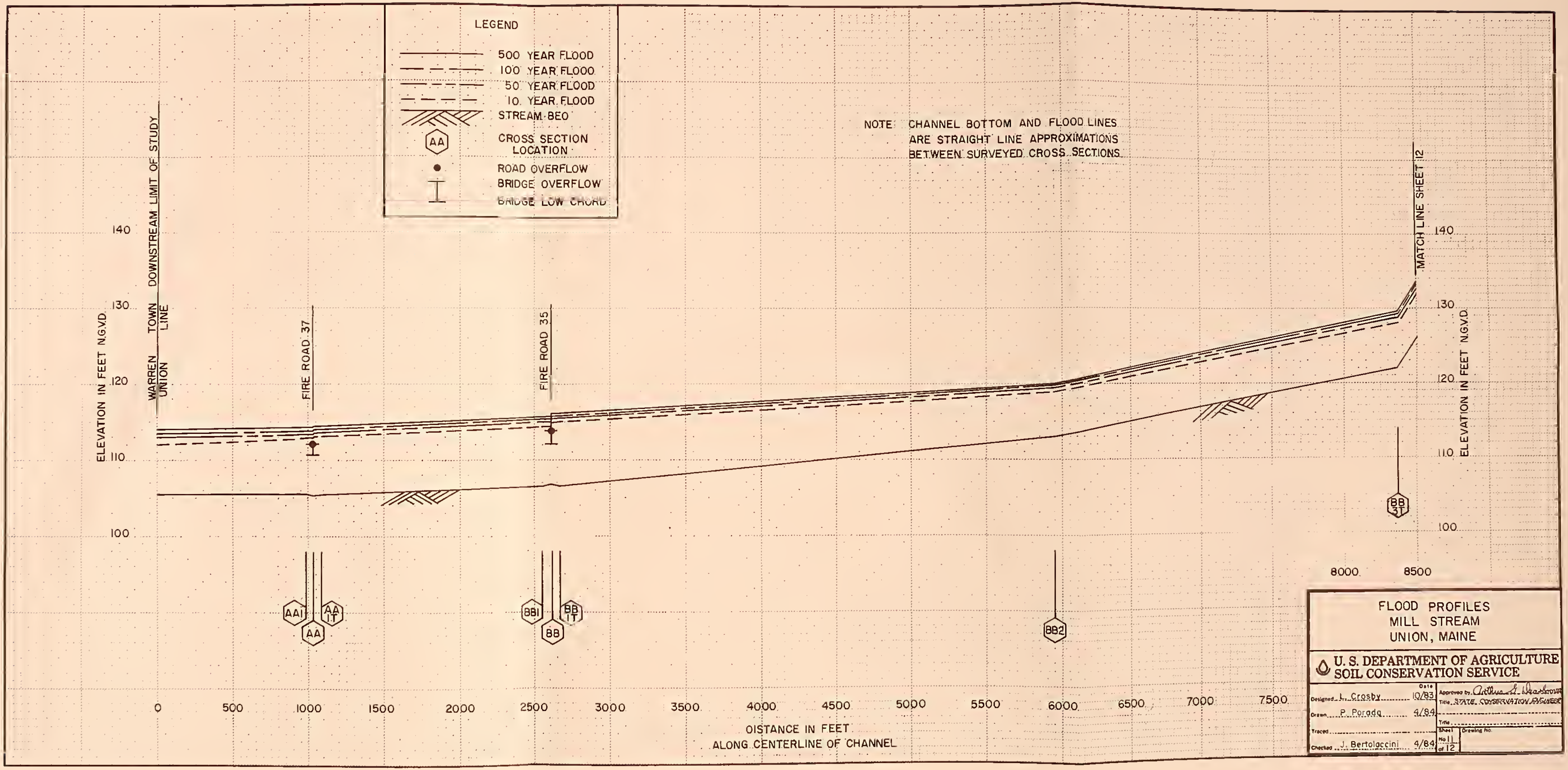
SOIL CONSERVATION SERVICE
U.S. DEPARTMENT OF AGRICULTURE

FLOOD PLAIN MAP
FLOOD PLAIN MANAGEMENT STUDY
TOWN OF UNION, MAINE

SHEET 15 OF 16

USDA-SCS-NATIONAL CARTOGRAPHIC CENTER, FT. WORTH, TX 1986

JUNE 1986 4-R-39749


LEGEND
500 YEAR FLOOD
100 YEAR FLOOD
50 YEAR FLOOD
10 YEAR FLOOD
STREAM BED
AA
CROSS SECTION LOCATION
ROAD OVERFLOW
BRIDGE OVERFLOW
BRIDGE LOW CHORD
NOTE: CHANNEL BOTTOM AND FLOOD LINES ARE STRAIGHT LINE APPROXIMATIONS BETWEEN SURVEYED CROSS SECTIONS.
DOWNSTREAM LIMIT OF STUDY
WARREN TOWN
UNION LINE
FIRE ROAD 37
FIRE ROAD 35
MATCH LINE SHEET 12
ELEVATION IN FEET N.G.V.D.
140
130
120
110
100
AA1
AA
AA 1T
BB1
BB
BB 1T
BB2
BB 3T
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000
6500
7000
7500
8000
8500
DISTANCE IN FEET ALONG CENTERLINE OF CHANNEL
FLOOD PROFILES
MILL STREAM
UNION, MAINE
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
Designed L. Crosby 10/83
Drawn P. Porada 4/84
Checked J. Bertolaccini 4/84
Approved by Arthur S. Dearborn
Title STATE CONSERVATION ENGINEER
Sheet No 11 of 12

LEGEND

500 YEAR FLOOD PLAIN

100 YEAR FLOOD PLAIN

10 YEAR FLOOD PLAIN

M1 VALLEY CROSS SECTION

25 100 YEAR FLOOD ELEV.

LIMITS OF FLOODING SHOWN MAY VARY FROM ACTUAL LOCATIONS ON THE GROUND AS EXPLAINED IN THE NARRATIVE.

NOTE:
LERMOND POND
NORMAL ELEV. 267
100 YEAR ELEV. 270

SCALE 0 500 1000 FEET
0 100 200 300 METERS
APPROXIMATE

SOIL CONSERVATION SERVICE
U.S. DEPARTMENT OF AGRICULTURE

FLOOD PLAIN MAP
FLOOD PLAIN MANAGEMENT STUDY
TOWN OF UNION, MAINE

SHEET 16 OF 16

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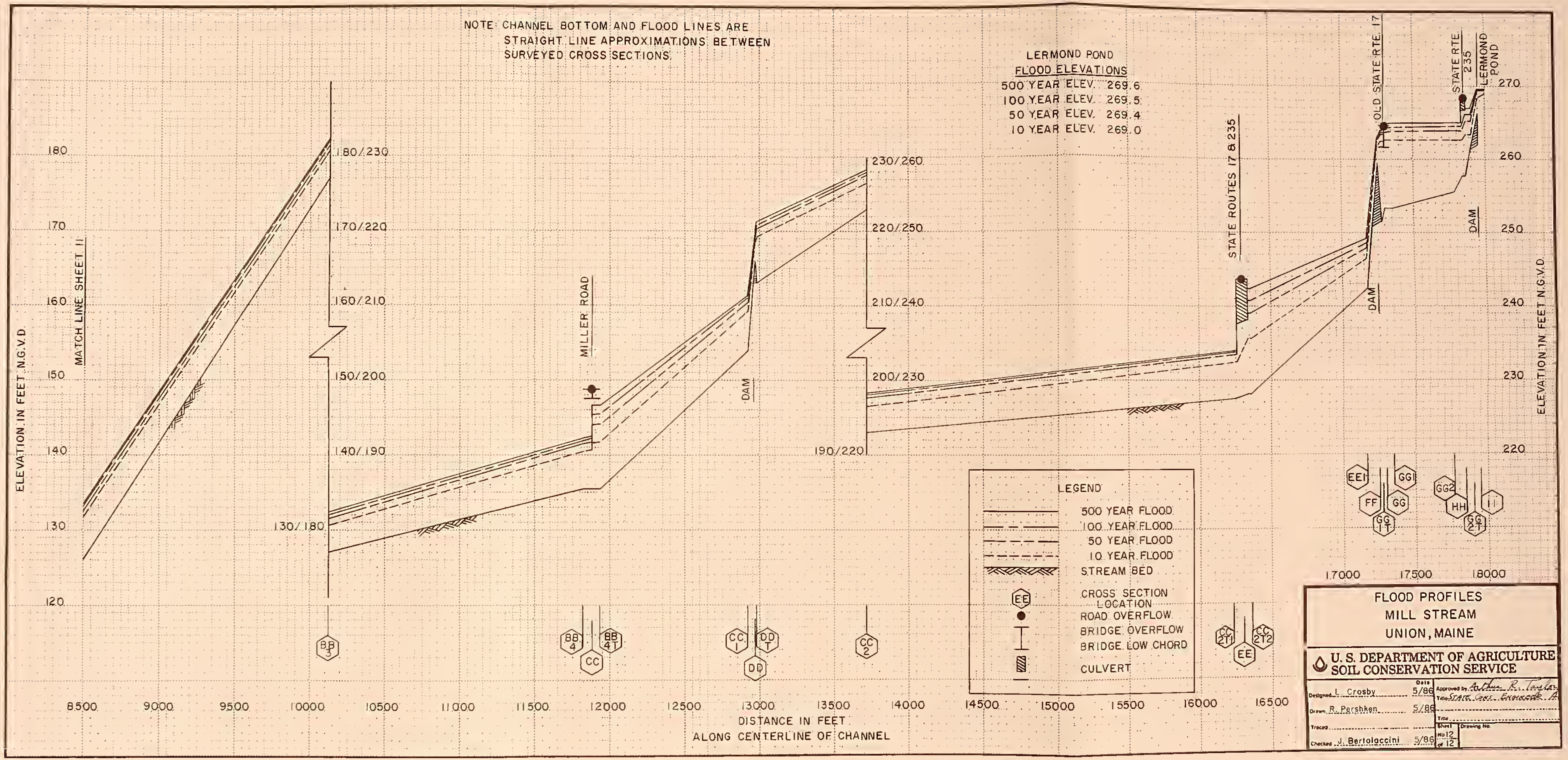
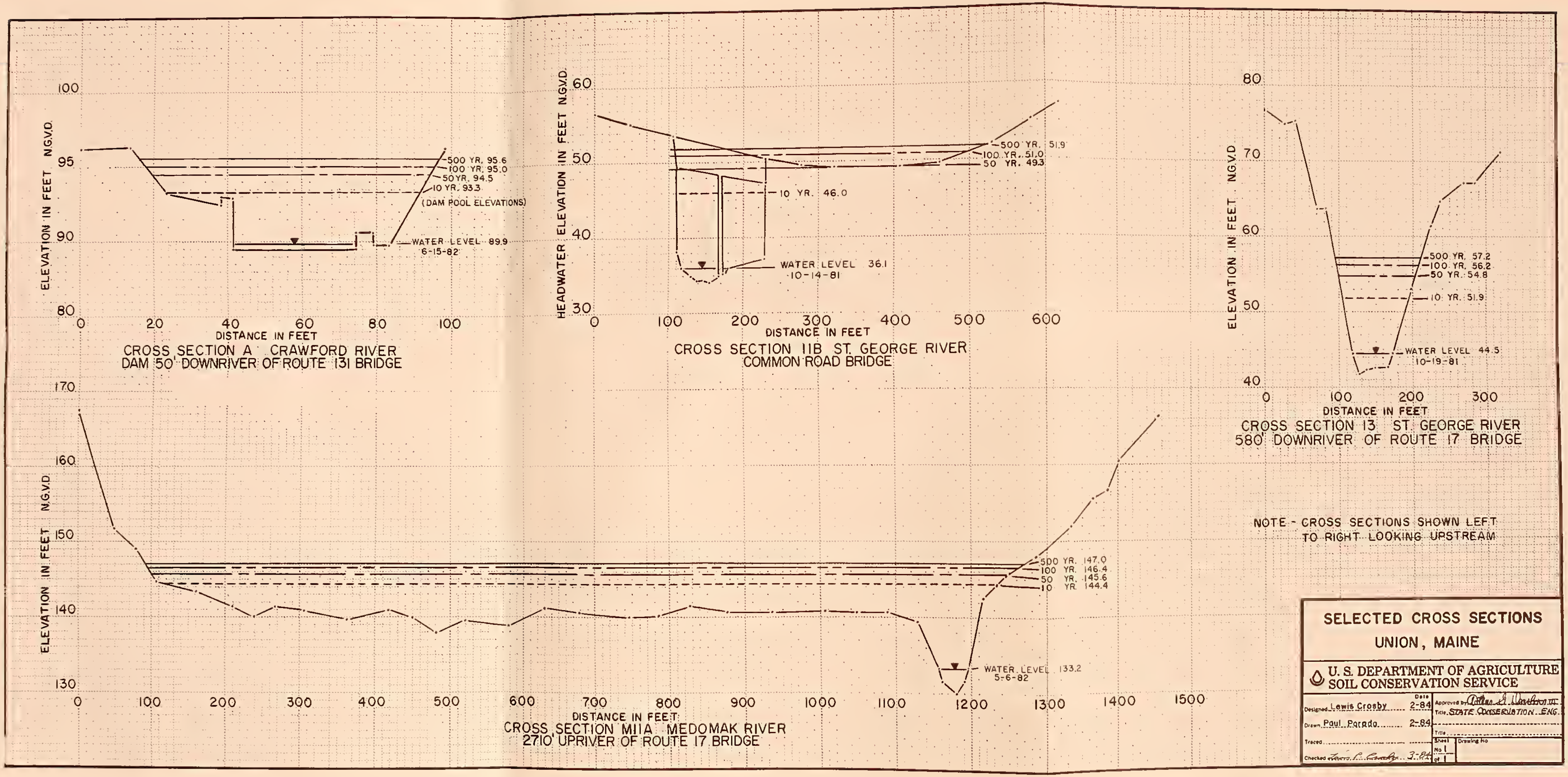

NOTE: CHANNEL BOTTOM AND FLOOD LINES ARE STRAIGHT LINE APPROXIMATIONS BETWEEN SURVEYED CROSS SECTIONS.
LERMOND POND FLOOD ELEVATIONS
500 YEAR ELEV. 269.6
100 YEAR ELEV. 269.5
50 YEAR ELEV. 269.4
10 YEAR ELEV. 269.0
ELEVATION IN FEET N.G.V.D.
MATCH LINE SHEET 11
MILLER ROAD
DAM
STATE ROUTES 17 & 235
OLD STATE RTE. 17
STATE RTE. 235
LERMOND POND
DAM
180/230
170/220
160/210
150/200
140/190
130/180
230/260
220/250
210/240
200/230
190/220
LEGEND
500 YEAR FLOOD
100 YEAR FLOOD
50 YEAR FLOOD
10 YEAR FLOOD
STREAM BED
CROSS SECTION LOCATION
ROAD OVERFLOW
BRIDGE OVERFLOW
BRIDGE LOW CHORD
CULVERT
DISTANCE IN FEET
ALONG CENTERLINE OF CHANNEL
FLOOD PROFILES
MILL STREAM
UNION, MAINE
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
Designed L. Crosby 5/86
Drawn R. Pershken 5/86
Checked J. Bertolaccini 5/86
Sheet No. 12 of 12



ELEVATION IN FEET N.G.V.D.
100
95
90
80
0 20 40 60 80 100
500 YR. 95.6
100 YR. 95.0
50 YR. 94.5
10 YR. 93.3
(DAM POOL ELEVATIONS)
WATER LEVEL 89.9
6-15-82
DISTANCE IN FEET
CROSS SECTION A CRAWFORD RIVER
DAM 50' DOWNRIVER OF ROUTE 131 BRIDGE
HEADWATER ELEVATION IN FEET N.G.V.D.
60
50
40
30
0 100 200 300 400 500 600
500 YR. 51.9
100 YR. 51.0
50 YR. 49.3
10 YR. 46.0
WATER LEVEL 36.1
10-14-81
DISTANCE IN FEET
CROSS SECTION 11B ST. GEORGE RIVER
COMMON ROAD BRIDGE
ELEVATION IN FEET N.G.V.D.
80
70
60
50
40
0 100 200 300
500 YR. 57.2
100 YR. 56.2
50 YR. 54.8
10 YR. 51.9
WATER LEVEL 44.5
10-19-81
DISTANCE IN FEET
CROSS SECTION 13 ST. GEORGE RIVER
580' DOWNRIVER OF ROUTE 17 BRIDGE
ELEVATION IN FEET N.G.V.D.
170
160
150
140
130
0 100 200 300 400 500 600 700 800 900 1000 1100 1200 1300 1400 1500
500 YR. 147.0
100 YR. 146.4
50 YR. 145.6
10 YR. 144.4
WATER LEVEL 133.2
5-6-82
DISTANCE IN FEET
CROSS SECTION M11A MEDOMAK RIVER
2710' UPRIVER OF ROUTE 17 BRIDGE
NOTE - CROSS SECTIONS SHOWN LEFT
TO RIGHT LOOKING UPSTREAM
SELECTED CROSS SECTIONS
UNION, MAINE
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
Designed Lewis Crosby 2-84
Drawn Paul Porado 2-84
Traced
Checked 3-84
Title STATE CONSERVATION ENG.
Sheet No 1 of 1
Drawing No

APPENDIX

Investigations and Analyses

Topographic data were obtained from surveyed and/or stereoplotted valley and bridge cross sections and 1" = 500' stereoplotted topographic maps with a 2-foot contour interval. Elevations are based upon National Geodetic Vertical Datum, 1929 (NGVD). Elevation bench marks that were used for this study are described in the Appendix and located on the Flood Plain Map Index and Flood Plain Maps.

Flood flows for various frequencies were computed from an analysis of stream hydraulics, soil cover, land use and rainfall data using the SCS TR-20 hydrologic evaluation model (9). Flood hydrographs were reservoir routed through 20 lakes and ponds in the St. George River watershed, and four in the Medomak River watershed. Because of the vast amounts of flood storage afforded by these bodies of water it was suspected that storms in excess of 24 hours would generate the highest peak discharge. After an analysis of the one day, two day, four day, seven day, and ten day 100-year storms it was found that the seven day and the two day storm produced the highest discharges for the St. George and the Medomak watersheds respectively. These storms were used in this flood plain study.

A table of selected discharges is located on page A-3.

The TR-20 models used in this study were originally created for flood plain management studies in the towns of Warren (10) and Waldoboro (11). Data contained in the Union report is in exact agreement with those studies.

Water surface profiles were developed using the SCS WSP2 computer program (12). The profiles were started from elevations at the Union townline contained in the Warren and Waldoboro Flood Plain Management Studies. Flood profiles were prepared showing computed water surface elevations for selected recurrence intervals and checked against historic data provided by U.S.G.S., Maine Department of Transportation, and others.

The hydraulic analyses for this study are based on the effects of unobstructed flow. The flood elevations shown on the profiles are valid only if the hydraulic structures remain unobstructed and dams and other flood control structures operate properly and do not fail.

The boundaries of the 10-year, 100-year and 500-year floods as shown on the maps were delineated from flood elevations determined at each cross section; between cross sections, the boundaries were interpolated from stereoplotted topographic maps with a 2-foot contour interval.

Field survey information, engineering computations, and other data pertinent to the study are on file with the Soil Conservation Service, USDA Office Building, University of Maine, Orono, Maine 04473, telephone (207) 866-2132.

SELECTED FLOOD DISCHARGES

Cross Section No.	Location	Drainage Area (Mi^2)	Flood Discharges (CFS) 10-Year	50-Year	100-Year	500-Year
MEDOMAK RIVER						
M1	Waldoboro-Union town line	46.09	2,990	4,250	5,400	6,960
M10B	State Route 17	35.27	2,820	3,940	4,920	6,220
M14B	Shepard Hill Road	33.25	2,820	3,960	4,940	6,240
M22B	Skidmore Road	19.44	2,310	3,240	4,040	5,140
M26C	North Union Road	16.84	2,130	2,980	3,720	4,710
M34T	Union-Washington town line	12.92	1,860	2,600	3,240	4,090
ST. GEORGE RIVER						
11B	Common Road	113.09	4,450	7,100	8,520	9,910
CRAWFORD RIVER						
B	State Route 131 South Union Road	30.26	910	1,450	1,790	2,140
MILL STREAM						
CC	Miller Road	8.96	410	690	850	1,000
HH	State Route 235	8.47	370	670	830	970

BRIDGE DATA

Cross Section No.	Location	Channel Bottom Elevations	Low Chord Elevations	Road Overflow Elevations	Flood Elevations 10-Year	Flood Elevations 50-Year	Flood Elevations 100-Year	Flood Elevations 500-Year
MEDOMAK RIVER								
M10B	State Route 17	128.4	143.3	145.5	143.9	145.2	146.0	146.6
M14B	Shepard Hill Road	134.6	144.8	147.6	148.3	148.8	149.4	150.2
M22B	Skidmore Road	148.1	160.9	163.8	159.2	161.0	161.8	164.2
M26C	North Union Road	160.0	170.7	179.0	179.7	181.2	181.8	182.6
ROUND POND OUTLET								
	State Route 235	29.6	44.8	43.5	41.2	44.0	45.4	46.9
ST. GEORGE RIVER								
2B	Foot Bridge	29.4	39.9	40.1	41.2	44.0	45.4	46.9
5B	Fairground Road	31.2	43.7	46.1	42.5	47.3	48.4	49.3
11B	Common Road	34.2	47.4	49.3	46.0	49.3	51.0	51.9
15B	State Route 17	41.4	66.3	69.0	53.8	56.7	58.1	59.2
CRAWFORD RIVER								
B	State Route 131 South Union Road	82.9	94.4	96.1	93.4	94.6	95.4	96.0
MILL STREAM								
AA	Fire Road 37	105.3	110.7	112.1	113.1	113.6	114.0	114.4
BB	Fire Road 35	106.8	112.1	113.8	114.9	115.4	115.7	116.1
CC	Miller Road	185.5	197.6	198.8	191.6	194.0	195.3	196.7
EE	State Route 17	228.1	238.1	243.6	235.7	239.0	240.7	242.3
GG	Old State Route 17	253.2	261.6	264.5	262.6	263.7	264.2	264.8
HH	State Route 235	257.8	266.8	268.2	263.3	265.1	266.1	267.0

Elevations refer to feet NGVD 1929, at upstream end of bridge opening.

POND DATA

Name	Nearest Elevation Bench Mark[1]	Drainage Area (Mi^2)	Assumed Elevation at Beginning of Storm[2]	Flood Elevations[2]			
				10-Year	50-Year	100-Year	500-Year
Seven Tree Pond	8,13,18	158.46	34.5	41.2	44.0	45.4	46.9
Round Pond	8,9,10	122.30	34.5	41.2	44.0	45.4	46.9
Sennebec Pond	16,17	112.20	84.0	89.7	91.2	91.9	92.5
Crawford Pond	18,19,20	30.13	110.0	111.7	112.6	113.1	113.5
Lermond Pond	24	8.47	266.5	269.0	269.4	269.5	269.6

1/ Refer to Bench Mark Descriptions - Appendix.

2/ Elevations refer to NGVD, 1929.

DAM DATA

Cross Section No.	Location	Drainage Area (Mi.^{2})	Type of Dam	Approximate Height of Dam (ft.)	Fishway	Present Use
ST. GEORGE RIVER						
23D	Sennebec Pond	112.20	concrete-gravity	10	No, fish ladder to be built with hydro project.	Recreation, being redeveloped for hydro power.
CRAWFORD RIVER						
A	Thurston Bros. Inc.	30.26	concrete-gravity	11	No	Hydro power.
MILL STREAM						
DD	1,090' upstream of Miller Road	8.79	concrete-gravity	12	No	Breached.
FF	50' dowmstream of Old State Route 17	8.52	granite-gravity	17	No	Hydro power.
II	Lermond Pond	8.47	concrete-stone-earth-gravity	5	No	Recreation, water storage.

Bench Mark Descriptions

1. USC and GS BM, Elev. 201.200

   North Waldoboro; on State Route 220 approximately 1,350 feet northwest of Medomak River bridge, 23 feet east of road centerline, 87 feet north of old driveway, on top of concrete post flush with ground; standard tablet stamped "C 47 1935".

2. SCS BM, Elev. 142.17

   Union; Old State Route 17 bridge over the Medomak River, on top of west end of south abutment; chiseled square.

3. SCS BM, Elev. 145.50

   Union; State Route 17 bridge over Medomak River, on top of south end of east abutment; chiseled square.

4. SCS BM, Elev. 142.65

   Union; Shepard Hill Road bridge over Medomak River, on top of north end of east abutment; chiseled square.

5. USGS BM, Elev. 308.691

   Union; 0.5 mile east of Shepard Hill Road bridge over the Medomak River on Carroll Road, 95 feet south of road centerline, 18 feet south of southeast corner of hen coop, about 115 feet south of and across road from house, in a large black rock; standard tablet stamped "5 RAK 1963 309".

6. SCS BM, Elev. 164.98

Union; Skidmore Road bridge over the Medomak River, on top of southern projecting end of the first I-beam from the east abutment; red paint spot.

7. SCS BM, Elev. 173.77

Union; North Union Road, at Medomak River crossing, on top of rock just above upstream opening of culvert; red paint spot in circle.

8. SCS BM, Elev. 48.84

Union; State Route 235 bridge over stream connecting Round and Seven Tree Pond, on top of southeast end of northeast abutment; chiseled square.

9. USC and GS BM, Elev. 71.791

Union; 0.5 miles west on State Route 17 from junction of State Route 131, 140 yards east the centerline of a graded road crossing, 72 feet south of the southwest corner of the former Round Pond School and 28 feet north of the centerline of State Route 17, on top of concrete post set flush with the ground; standard tablet stamped "A 52 1935".

10. SCS BM, Elev. 39.87

Union; foot bridge over the St. George River at the Union Fairgrounds, on top of the east end of the north abutment; chiseled square.

11. SCS BM, Elev. 45.30

Union; Fairgrounds bridge over the St. George River, on top of the east end of the north abutment; chiseled square.

12. SCS BM, Elev. 51.40

Union; Common Road bridge over the St. George River, on top of the north end of the east abutment; chiseled square.

13. USGS BM, Elev. 96.801

Union; at Common, 94 feet south of the southwest corner of the Civil War Monument, 37 feet north of the centerline of road, 29 feet west of the flagpole, in the top of a rock outcrop; standard tablet stamped "MAINE 97 FT.".

14. SCS BM, Elev. 69.86

Union; State Route 17 bridge over the St. George River, on top of the north end of the west abutment; chiseled square.

15. SCS BM, Elev. 87.95

Union, "Dirigo Power Company" bridge over power canal which connects Sennebec Pond dam with old turbine site, on top of north end of west abutment; chiseled square.

16. SCS BM, Elev. 89.25

Union; Sennebec Pond dam, on top, southwest corner of east wall of dam, just above east end of spillway; chiseled square.

17. SCS BM, Elev. 90.00

Union; Sennebec Pond dam, top of southwest anchor bolt of gate wheel on west side of dam; painted red.

18. USC and GS BM, Elev. 96.151

South Union; near State Route 131 bridge over Crawford River, 40 feet west of west face of bridge, on top of a granite ledge on the west side of the river; standard tablet stamped "U 48 1935".

19. SCS BM, Elev. 112.29

Union; near Fire Road 37 bridge over Mill Stream, on top of rock near the northeast corner of bridge; paint spot.

20. SCS BM, Elev. 110.93

Union; Fire Road 35 bridge over Mill Stream on top, south end of old railroad rail, used as abutment on the east side of stream; paint spot.

21. SCS BM, Elev. 198.64

Union; Miller Road bridge over Mill Stream, on top of north end of east abutment; chiseled square.

22. SCS BM, Elev. 220.37

Union; Mill Stream, at remains of mill located approximately 0.5 miles downstream of State Route 17, top of bolt in west wall of old mill foundation, 22 feet and first bolt from northwest corner of wall; painted red.

23. SCS BM, Elev. 264.47

East Union; Old State Route 17 bridge over Mill Stream, on top of north end of west abutment; chiseled square.

24. SCS BM, Elev. 267.49

East Union; State Route 235 bridge over Mill Stream, on top of west end of north abutment; chiseled square.

Glossary

Aquisition - Purchasing flood prone properties for the specific purpose of reducing flood damage by changing land use.

Bench Mark - A point of known elevation based on National Geodetic Vertical Datum (NGVD) that can be used to determine elevations at other desired locations in the area of concern.

C.F.S. - Cubic feet per second. Used to describe the amount of flow passing a given point in a stream channel. One cubic foot per second is equivalent to approximately 7.5 gallons per second.

Channel - A natural or artificial watercourse with definite bed and banks to confine and conduct flowing water.

Critical Area Treatment - The application of vegetative and mechanical practices used to reduce runoff and erosion. Practices normally consist of seeding, tree planting, grass waterways, diversions, gully stabilizations, etc.

Cross Section - A graph or plot of ground elevation across a stream valley or a portion of it, usually along a line perpendicular to the stream or direction of flow.

Environmental Corridor - A strip of land, usually along one or both sides of a stream, which is set aside, regulated, or otherwise protected to preserve its environmental values.

Erosion - The group of processes whereby soil or rock material is loosened or dissolved and removed from any part of the earth's surface.

Flood - An overflow or inundation onto land areas not normally covered by water that are used or usable by people. Floods are usually characterized as temporarily inundating land areas which are adjacent to a body of water such as an ocean, lake, stream or river.

Flood Crest - The maximum stage or elevation reached by the waters of a flood at any location.

Flood Peak - The maximum instantaneous discharge of a flood at a given location usually occurring at the flood crest.

Flood Plain - The relatively flat area of lowlands adjoining the channel of a river, stream, or watercourse or ocean, lake, or other body of standing water which has been or may be covered by floodwater.

Flood Plain Management - The operation of a program intended to lessen the damaging effects of floods, maintain and enhance natural values, and make effective use of relative water and land resources within the flood plain. It is an attempt to balance values obtainable from use of flood plains with potential losses arising from such use. Flood plain management stresses consideration of the full range of measures potentially useful in achieving its objectives.

Flood Plain Map - A map showing the lateral extent of projected floods.

Flood Profile - A graph which shows the relationship of water surface elevation to distance along the centerline of channel. It is used in this report to show the crest elevations of specific floods.

Floodproofing - A combination of structural changes and adjustments to new or existing structures and facilities, their contents and/or their sites for the purpose of reducing or eliminating flood damages by protecting against structural failure, keeping water out, or reducing the effect of water entry.

Flood Warning - The issuance and dissemination of information about an imminent or current flood.

Floodway - That portion of the main stream channel plus any adjacent flood plain areas that must be kept free of encroachment in order that the 100-year flood can be carried without substantial increases in flood heights.

Frequency - A statistical measure of how often an event of a given size or magnitude should, on the average, be equalled or exceeded.

(a) A 500-year frequency flood is one that is equalled or exceeded, on the average, once in 500 years. It has a 0.2 percent chance of being equalled or exceeded in any given year.

(b) A 100-year frequency flood is one that is equalled or exceeded on the average, once in 100 years. It has a 1 percent chance of being equalled or exceeded in any given year.

(c) A 50-year frequency flood is one that is equalled or exceeded on the average once in 50 years and has a 2 percent chance of being equalled or exceeded in any year.

(d) A 10-year frequency flood is one that is equalled or exceeded, on the average, once in 10 years and has a 10 percent chance of being equalled or exceeded in any year.

Head - The height of water above any plane of reference.

Head Loss - The effect of obstructions, such as narrow bridge openings or buildings, that limit the area through which water must flow, raising the surface of the water upstream from the obstruction.

High Hazard Zone - An area, normally nearest the stream, where flooding may cause a significant risk to loss of life and property. This area is defined by flood velocities higher than 12 feet per second (fps), flood depths greater than 3 feet, or a combination of velocity and depth greater than 7.

Important Farmland -

Prime: Land that has the best combination of physical and chemical characteristics for producing food, feed, fiber, and oilseed crops, and is also available for these uses. This includes: cropland, pastureland, rangeland and forestlands. It does not include urbanized land or water. Land in this category has the soil quality, growing season, and moisture supply needed to produce sustained high yields of crops economically when treated and managed (including water management), according to modern agricultural methods.

Additional Farmland of Statewide Importance: Land, in addition to prime farmland, that is of statewide importance for the production of food, fiber, feed, forage, and oilseed crops. Criteria for defining and delineating these lands are to be determined by the appropriate state agency or agencies. Generally these lands include those that are nearly prime farmland and that can economically produce high yields of crops when treated and managed according to acceptable farming methods. Some may produce as high a yield as prime farmlands if conditions are favorable, and in some states these lands may include tracts of land that have been designated for agriculture by state laws.

Low Chord - The elevation at which the bridge girder first begins to reduce the flow area of the channel.

Low Hazard Zone - The area between the high hazard zone and the maximum extent of the 100-year frequency flood where the potential for loss of life and property damage is low.

Natural Values of Flood Plains - The desirable qualities of, or functions served by, flood plains including, but not limited to: water resources values (e.g., moderation of floods, water quality maintenance and groundwater recharge), living resources values (e.g., fish, wildlife and plant resources and habitat), cultural resources values (e.g., open space, natural beauty, scientific study, outdoor education, and recreation), and cultivated resource values (e.g., agriculture, aquaculture and forestry).

NGVD - National Geodetic Vertical Datum, formerly Mean Sea Level (MSL) 1929.

Nonstructural Measures - All flood plain management measures excepting structural flood control works. Examples of nonstructural measures are flood warning/preparedness systems, relocation, floodproofing, regulation, land acquisition, and public investment policy.

Normal River Flow - That condition which represents average low flow within channel banks.

Relocation - Moving a building from a flood prone area by physically placing it on a vehicle and transporting it from the flood plain.

Road Overflow - The elevation of the point at which water first starts to flow over the road.

Station - Distance in feet along the centerline of the existing channel, increasing in an upstream direction.

Structural Measure - Flood control works such as dams and reservoirs, dikes and floodwalls, channel alterations, and diversion channels which are designed to keep water away from specific developments and/or populated areas or to reduce flooding in such areas.

Wetland - An area where saturation with water is the dominant factor determining the nature of soil development and the types of plant and animal communities present; generally includes swamps, marshes, bogs, shallow lakes, and similar areas.

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